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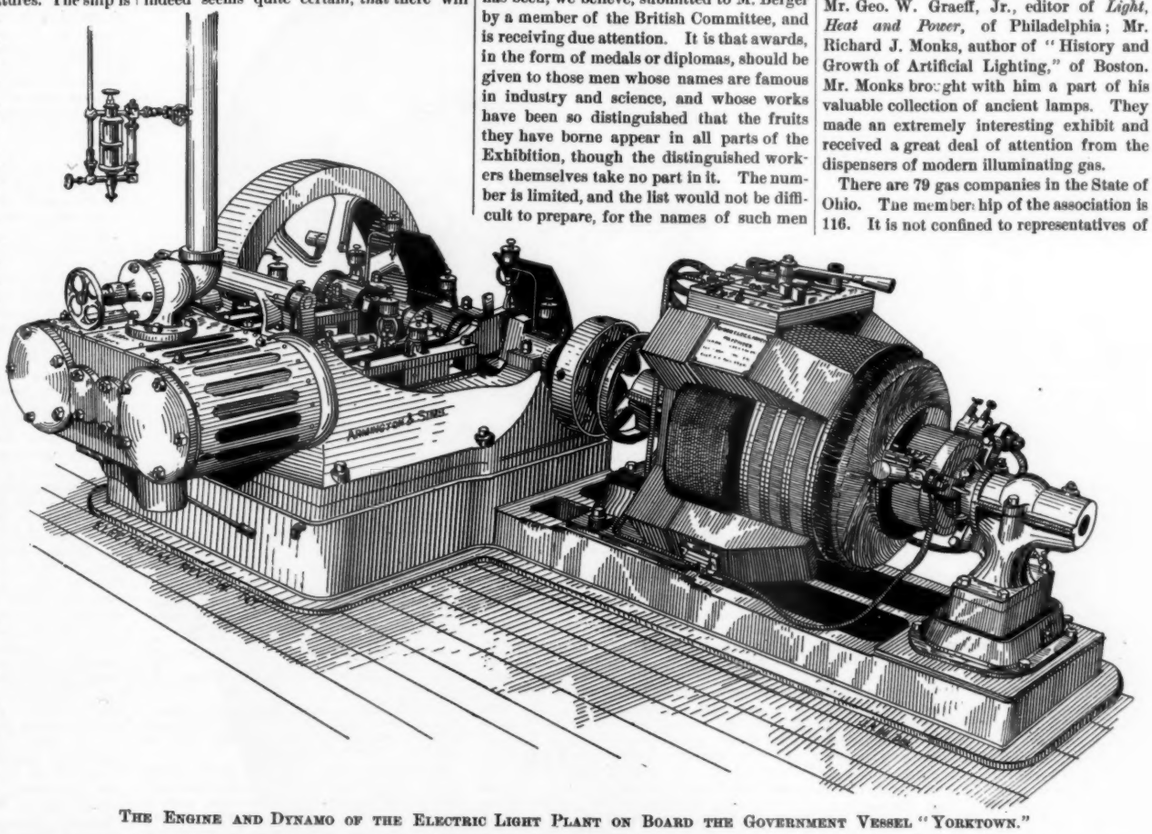
Electric Light on Board the "Yorktown."

The Edison lighting plant on the new naval cruiser "Yorktown" has been completed and tested, and found exceedingly satisfactory. The first dynamo designed for this vessel was finished last July, but failed to meet the requirements of the department in the heating test, and was rejected. The armatures of the dynamo finally accepted were rewound several times before they came up to the specifications. The final heating tests showed that after running four hours under full loads, the rise in temperature above that of the atmosphere was 35° and 40° F. for the fields, and 36° and 39° F. for the armatures. The ship is supplied with 136 ten candle power, 88 sixteen candle power, and 16 thirty-two candle power lamps. The dynamo generates a current of 100 amperes and 80 volts.

The power is supplied by a 20 horse power, double-acting Armington & Sims engine, of special design, connected direct to the dynamo by flexible couplings, and running at a speed of 400 revolutions per minute. The weight of the engine is 2,000 pounds, bed-plate 800 pounds, dynamo 1,850 pounds, and this machinery occupies a floor space less than 4x8 feet. There is an exact duplicate of this part of the plant. This equipment of the "Yorktown" is claimed to be by far the best lighting system ever placed on a vessel of the United States Navy. Our illustration shows the engine and dynamo, the latter of special design.

Five Edison dynamos of the same type—two for the "Charleston," two for the "Baltimore," and one for the "Pensacola"—have been completed and are now being fitted to their engines at the Armington & Sims works at Providence, R. I.



THE ENGINE AND DYNAMO OF THE ELECTRIC LIGHT PLANT ON BOARD THE GOVERNMENT VESSEL "YORKTOWN."

The Perkins Electric Lamp Company.

The Perkins Electric Lamp Company was organized March 16th, 1889, for the purpose of manufacturing the Perkins incandescent lamp and socket. This company has bought from the Mather Electric Company all their machinery and appliances for this work, and have rented a part of the Mather Company's factory. They propose to make lamps of all voltages and to fit all sockets. The Perkins incandescent lamp is well and favorably known to the electrical field, and the new company will be a strong factor in the business of electric lamp manufacture.

The officers of the company are M. S. Chapman, president; W. G. Halm, vice-president; C. S Welles, treasurer, and J. J. Gates, secretary, the last named gentleman having been with the Mather Company for nearly four years and is thoroughly acquainted with the electrical field. The main offices of the company will be at 314 Pearl street, Hartford; the factory at Manchester, Conn. A branch office will be opened in Chicago, with Mr. W. G. Halm in charge as Western manager.

Paris Exhibition Awards.

The Paris Exhibition authorities have not yet decided upon the plan to be adopted as to jury examinations of exhibits, or as to reports and awards, nor indeed is it by any means settled whether there will be any juries, reports, or awards at all. One thing indeed seems quite certain, that there will be no distribution of medals, the utmost that would be done being the possible giving of diplomas of different shades of merit. Upon the whole, the chances appear in favor of a total abandonment of the jury and award system, and in its place the substitution of an official document given to every exhibitor certifying his presence at the Exhibition; the object of such a certificate does not appear very clear. So far as this country is concerned, says London *Engineering*, we believe that the general feeling of exhibitors will be against the granting of awards; and this for several reasons. At Manchester and Glasgow, the abandonment of the system, which has been gradually falling into disrepute, was favorably received by the exhibitors who are always—excepting of course the recipients of medals and diplomas—opposed to juries' reports, which they regard as more or less superficial and prejudiced. More especially will this objection hold good in Paris, where the very small proportion of British jurymen will render it almost impossible for English Exhibitors to obtain a fair proportion of recognition in the general struggle of each country's representatives. But if the decision be taken, and we think it will be a wise decision, to follow the example that has been set in England and abandon all attempts to pronounce on the respective merits of exhibitors, the present Exhibition offers a splendid opportunity for a new departure in official recompense. The idea has been, we believe, submitted to M. Berger by a member of the British Committee, and is receiving due attention. It is that awards, in the form of medals or diplomas, should be given to those men whose names are famous in industry and science, and whose works have been so distinguished that the fruits they have borne appear in all parts of the Exhibition, though the distinguished workers themselves take no part in it. The number is limited, and the list would not be difficult to prepare, for the names of such men are familiar to all the world. Pasteur, Chevreuil, Dumas, Gramme, Eiffel, De Lesseps, Bessemer, Wylde, Swan, Armstrong, Edison, Bell, Alvan Clarke, are conspicuous examples of those whose labors have advanced civilization in all its branches. So, too, those societies all over the world, whose mission it has been successfully to promote industry and science, could be appropriately recognized, for without their help and co-operation in the general cause of advancement, the Paris Exhibition of 1889 would have fallen miserably short of its present measure of success.

—— Amherst, Mass., will turn on electric lights very soon.

—— Rutland, Vt., is agitating the subject of municipal lighting.

OHIO GAS ASSOCIATION.

The Fifth Annual Convention of the Ohio Gas Light Association—Addresses and Exhibitors.

REPORTED FOR THE ELECTRICAL REVIEW BY ALLEN R. FOOTE.

This convention was held March 20th and 21st, in the city of Mansfield. The meetings were attended by about 140 persons, some of whom came from neighboring states and a few from far distant cities. Noticeable among the distinguished visitors were Mr. J. R. Thomas, editor of the *American Gas Light Journal*, of New York city; Mr. Geo. W. Graeff, Jr., editor of *Light, Heat and Power*, of Philadelphia; Mr. Richard J. Monks, author of "History and Growth of Artificial Lighting," of Boston. Mr. Monks brought with him a part of his valuable collection of ancient lamps. They made an extremely interesting exhibit and received a great deal of attention from the dispensers of modern illuminating gas.

There are 79 gas companies in the State of Ohio. The membership of the association is 116. It is not confined to representatives of operating gas companies within the State. Representatives of manufacturing interests, gas engineers, and others who are non-residents, are admitted to membership.

The headquarters of the association were established at the St. James Hotel, where all that could be done to contribute to comfort and social intercourse, was most perfectly provided by the genial proprietor, Mr. J. B. Franz. As a result, not the least noticeable feature of parting salutations, was the numerous calls for Mr. Franz, to privately assure him of the appreciation felt for his efforts. Mr. Franz returns these compliments by affirming that a more orderly, good natured body of men than the "Ohio Gas Light Association" has never been entertained at the St. James Hotel.

An event occurring but once a year, based

on the solid foundation of mutuality of business, and enlivened by the zest of jovial greetings and intercourse, can be safely relied upon to attract attention and exert an influence, radiating far beyond the limits of its immediate sphere.

This fact was illustrated at each session, by letters and telegrams received from persons far separated from each other, at the extremes of the country, sending their congratulations and words of cheer.

Finding that there is nothing unsual in the development of the gas industry in Mansfield, to attract or interest the Association, I think the gas men went there to get acquainted with "The Twin." Under the peculiar condition of Ohio laws, gas companies as such, cannot go into the business of supplying their cities with an electric service. The result of this is illustrated by the condition of affairs in Mansfield. There are two companies, "the Mansfield Gas and Coke Company," and "the Mansfield Electric Light and Power Company." Both companies are owned by the same men. Both plants and offices are on the same premises. While there are two sets of books, they are kept by the same accountants. About 12 companies in the State are now doing business in this way, illustrating the impotency of laws that do not accord with the requirements of economic conditions to seriously change the course of business progress. On the 21st, the bill before the State Legislature, authorizing gas companies to do an electric service business, was defeated in the Senate where but one vote was cast in its favor. This does not show that any vote was cast against the bill with an intelligent reference to its demerits. It simply illustrates the force of the latest political craze to down monopolies.

The association found the condition of affairs in Mansfield, in the line of their interests, to be as follows:

1st. The gas company, having a well kept plant under the efficient management of George S. Harris, engineer and manager. The quality of the gas is good, but the output is smaller than one expects to find in a city of 15,000. Diligent inquiry was made as to the cause of this. Mr. L. A. Strong, president of the gas company, assured me privately, as he did the association in open meeting, that he attributes the cause, first, to the low price of coal oil.

On account of the operations of a local company, he says: "Oil can be bought in Mansfield and shipped to any point in the State with a profit." Second, to the fact that a reduction in the price of gas was not made soon enough to gain a prestige for liberal dealing. President Strong did not hesitate to emphasize the fact that the introduction of the electric light had increased the consumption of gas. That many consumers have abandoned oil for electricity, who would not abandon it for gas, and that the lighting of the streets by arc lamps paid his company better, and gave greater satisfaction to the citizens than did the service rendered by gas lamps. Such testimony as this is extremely important to gas companies in small cities.

2d. The electric plant owned and operated by the gas company consists of three Western Electric low tension dynamos. 22 arc lamps are rented commercially and 78 are used for street lighting. The street circuits are operated by one 45 and one 35 arc light dynamo. There are 18 miles of circuit. Two engines, one 125 horse-power and one 60 horse-power. The company do not yet supply motors or incandescent lamps. The far-seeing enterprise of this company is made prominently evident by the fact that their electric plant was installed four years ago, when it was considered to be the proper behavior for gas men to make faces at the "The Twin" instead of smiling on him. Other very important facts are found in the record made by the operation of this plant. Though installed four years ago when no insulation better than that known as "Underwriters" of that period was used, and when the automatic cut-outs, switches and other devices now justly so highly prized were unknown, Manager Harris reports that they have never burned out an armature, have never started a fire with the current, nor have they ever injured any person by accident. Such facts as these are valuable in a double sense. They not only illustrate the safety of the electric service in every respect, but they show conclusively that if a gas company had in its employ an engineer with a good head on him, they have a man who can take charge of the operation of an electric light plant.

3d. The Mansfield Street Railroad Company, using the Daft system, offer as good an exhibit of electric motor power as can be found in the country. This road will have been in operation two years the coming August. Its length is four and a half miles. Two dynamos of 50 horse power each are employed at the driving station, one being a reserve. Five cars, 14 feet in length, are in use. Each car is supplied with one motor, seven and a half horse power. The current is taken from an overhead wire, and the return current is carried by a wire running parallel with the feeder. The voltage is 220. The interesting part of the construction is in the fact that the road is *all grade*. At no point is the grade less than four per cent., while there is one grade one-eighth of a mile long, of seven and a half per cent., and another, one-quarter of a mile long, of nine and a half per cent. Notwithstanding these grades, the round trip of eight miles is made in less time than that averaged by horse cars on a level track. A car loaded with 88 persons has been carried over these grades in satisfactory time. No difficulty has been experienced with the traction. On but a few occasions, when the track has been covered with sleet or ice, has it been necessary to resort to the use of sand or salt. No accidents from the use of electricity have occurred on this road. The cars are under perfect control, and their use is popular with the people.

The manager informs me that the imperfections attendant upon pioneer construction are being rapidly overcome, and expresses a firm belief that the final success of the road will satisfy the expectations of its projectors and owners.

This company has also installed a Westinghouse alternating current plant for electric lighting. They have one dynamo of 850 lamp capacity, and report 880 lamps under contract. They do not yet supply meters or motors. They report a satisfactory service, no burned out armatures and no accidents.

This review of gas and electrical development in Mansfield shows it to be a pioneer town in the combination of electric and gas plants and in electric railroads. A good town for a gas association to visit, to catch the spirit of enterprise and scent the trend of coming events.

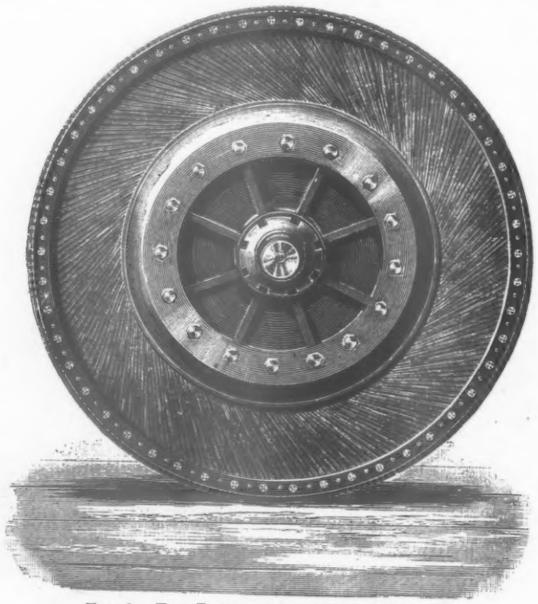


FIG. 2.—THE FRITSCHE ARMATURE, COMPLETE.

The convention was presided over by its president, Thomas Woods, superintendent and secretary of the gas and electric light companies, of Sandusky, Ohio. Here is another exhibition of clear-headed enterprise. Mr. Wood informed the convention that his double company furnished gas, arc lights and incandescent lights. That the combination had been a good thing for the stockholders and was satisfactory to the citizens. That if they were to day placed in the position they were in before they adopted the electric service as a part of their system, but with their present experience, they would at once go into the electric business, and would build better and more of it. Advice like this, from one in his position, can but be gratifying to those interested in the electric industry, and must make a lasting effect upon the minds of gas men.

One other bit of advice he gave in his opening address that should have an influence beyond the limits of this association. It is to the effect that it should be the object of the association to bring together the practical working men in the gas industry. Those whose time is occupied in the daily effort to produce in the sphere of actual operation, the results promised by inventors, manufacturers and journalistic theorists. When such men are brought together, then it is his ideal to have an *experience meeting*, where all vital or minor points, touching the interests served, can be discussed without the presence of restraining influences.

It was very apparent that the hope of this bit of advice was not realized at this convention. In private conversation with many members I discovered that they all felt the "restraining influence" in the presence of the representatives of manufacturers. One of the best practical gas engineers in the State, said to me: "I will not become a member of the association, nor attend its meetings, because I will not discuss, in the presence of men from whom our apparatus is bought, my methods of operating it or the results I obtained from it. That is what the practical men attending such meetings want to know. That is what they will never find out with the representatives of manufacturers present. I do not object to consulting with manufacturers, but when I want to consult with men employed as I am in the practical work of producing gas for a profit, I do not want manufacturers present to hear what I or they have to say. I cannot write a news paper article, but I can tell a man engaged in the same work that I am, how my work is done and what results I obtain. That is what practical men want to know."

The following is a list of the papers prepared for this convention. They will, undoubtedly, be fully reported in the gas journals.

1. "Is the Supply of Natural Gas in the Ohio Valley Failing?" Eugine Printz, superintendent Gas Light Company, Zanesville, Ohio.
2. "Gas Monopoly." W. W. Cantine, secretary Gas Company, Alliance, Ohio.
3. "The Methods of Taxation of the Different Gas Companies and a Comparison of the Same." H. Wilkiemeyer, superintendent Gas Light Company, Portsmouth, Ohio.
4. "Carburated Water Gas and its Advantages over Coal Gas." Chas. R. Faben, Jr., superintendent Gas Light and Coke Company, Toledo, Ohio.
5. "Advantages of a Combined Coal and Water Gas Plant." Geo. Light, assistant superintendent Gas Light and Coke Company, Dayton, Ohio.
6. "A Holder-Tank Problem." Geo. H. Tayler, superintendent Gas Light Company, Warren, Ohio.
7. "The Welsbach Burner as a Commercial Article." Geo. W. Graeff, Jr., editor *Light, Heat and Power*, Philadelphia, Pa.
8. "Results of the Adoption of Electric Lighting by a Gas Company." L. A. Strong, president Gas Light Company, Mansfield, Ohio.
9. "The Lowest Price at which Gas can be Profitably Sold in Small Towns." H. L. Hurlburt, superintendent Gas Light Company, Oberlin, Ohio.
10. "Oil as a Fuel under Boilers." J. W. Gwinn, superintendent Gas Light and Fuel Company, Bucyrus, Ohio.
11. "Fuel Gas and Incandescent Lighting." Edward Lindsley, engineer People's Gas Light Company, Cleveland, Ohio.
12. "Fuel Gas: Results of Experience in its Manufacture, Distribution and Use." Chas. H. Evans, manager Jackson National Gas Light and Fuel Company, Jackson, Mich.

The efficient secretary, Mr. Irvin Butterworth, superintendent of works, Gas Light and Coke Company, of Columbus, says he is fully satisfied that the gas men of Ohio are the hardest worked men in the world. In evidence of this, he reports some of the excuses made by those to whom he applied to prepare papers to be read at this Convention. It appears from a statement before me, that Secretary Butterworth took the very practical course of addressing a letter to each member of the association, asking what subjects he wished to hear discussed at the Mansfield Convention. Forty-six subjects were proposed, seven of which (nearly one-seventh) relate to the electric service. Notwithstanding this evident interest in electrical subjects, the proposition to change their name to "The Ohio Gas and Electric Association" was voted down with a promptness which made it impossible to find out how the proposal ever came to be made. The true inwardness of this vote, I found to be in the fact that the members felt that if they added to the manufacturers of gas apparatus, the manufacturers of electrical apparatus, admitting both into their membership and meetings on equal terms, they would be killed entirely.

The association was entertained at a banquet, on the evening of the 20th, tendered by the City Council, water department, and the local gas and electric companies. On account of the excellence of the water supplied by its department to the citizens of Mansfield, the banquet was served without wine—a feature that was very gratifying to all present. Many were delighted to find that water could be so good. The spread was excellent, the music fine, the flow of wit and social intercourse was brilliant and unmarred by a single flaw; "a diamond of the first water," a natural resultant of pure Mansfield water. His Honor, the Mayor, the President of the Council, and other local and invited orators responded to toasts in good artistic style. One speaker, treating of the history of light—not Mr. Monks—said that "in the beginning, darkness was separated from the light, the light was called day, and the darkness was called night. The sun was made to rule over the day, and the moon to rule over the night. That is the origin of the Philadelphia schedule; a schedule too ancient to be used in our present civilization. The schedule we now want is one that requires the electric light to shine from dark until daylight, all night, and every night in the year.

Mr. Edward Lindsley, engineer and superintendent of the People's Gas Light Co., of Cleveland, was elected president for the ensuing year. Mr. Irvin Butterworth, of Columbus, was re-elected secretary. Messrs. A. J. Stoll, president of the Gas and Electric Light Companies of Sandusky, and H. Wilkiemeyer, secretary and superintendent of the Gas Light and Coke Co., of Portsmouth, together with the president, are a Committee on Legislation. The place selected for the next meeting is Toledo. The convention will meet "The Twin" there again, as the Toledo Gas Co. is operating a large electric light plant.

The convention closed its session on the afternoon of the 21st by adjourning to the station of the Gas and Electric Co. to make the acquaintance of, and shake hands with, "The Twin," which is enabling that company to make dividends on a part of its business that was unprofitable in the past and is having a marked influence in increasing the the companies income.

THE EXHIBITION.

Since electrical conventions have been very proud of the interest taken by the general public in exhibitions of electrical apparatus, it may be well for them to know that an exhibition of devices for using gas was made at this convention, and that the interest taken in it by the general public was in no way less than that shown at electrical exhibits. The public can always be relied upon to take a keen interest in anything that promises a gain in comfort and convenience.

The exhibition was held in a convenient vacant store. Stoves for cooking and heating were the leading features. These proved so great an attraction to the ladies of the city, that the room was thronged with them. Sales were so lively, I doubt if any stove sent to the exhibition had to be shipped away. The following manufacturers were represented: Chicago Gas Stove Co.; the "Favorite" Gas Cooking Range, manufactured by the Phillips Meter and Gas Stove Works, of Cincinnati, Ohio; Gas Cooking and Heating Stoves, manufactured by the VanWie Gas Stove Co., of Cleveland, Ohio; the Success Gas Range, manufactured by the Maryland Meter and Manufacturing Co., of Baltimore, Chicago and St. Louis; the Sun Dial Gas Heating Stove, manufactured by the Goodwin Gas Stove and Meter Co., of Chicago; the Lungren Regenerative Gas Lamp, of Philadelphia; the Welsbach Burner, of Philadelphia; Diffusive Gas and Day-Dight Reflectors, Gas and Lamp Shades, manufactured by B. Goetz Manufacturing Co., of New York; gas exhausters, valves and other specialties, manufactured by R. H. and E. M. Roots, of Connerville, Ind.; gas generators, Pratt & Ryan process, manufactured by Henry Pratt & Co., of Chicago; mineral wool, manufactured by Western Mineral Wool Co., of Cleveland and St. Louis; the National Barrow and Truck Co., of New York; the Western Electric Co., of Chicago, represented by the G. O. M.; the Sperry Electric Co., of Chicago; the Schuyler Electric Co., of Hartford, Conn.

The Fritsche Wheel Dynamo.

We are indebted to our esteemed contemporary *Industries* for the following description of this unique machine:

This is a type of machine simultaneously evolved in France by M. Desrozier, and in Germany by Herr Fritsche. Both these gentlemen will probably claim that the machine of each is essentially different from that of the other; but to impartial electricians the difference will appear to be rather one of detail than of principle. As far as the principle is concerned, these gentlemen

have indeed come back to a very old machine, which originated some seven or eight years ago in England, the Elphinstone-Vincent dynamo. M. Desrozier has taken up this type, and so far improved its details as to produce a good, serviceable machine, which is now being made by the Maison Breguet, Paris. A number of these machines are now at work, chiefly on board ship, and are giving satisfaction. One of the most current sizes has an output of 170 amperes at 105 volts pressure, the speed being 350 revolutions per minute. The electrical efficiency is given by the inventor as 83.2 per cent., and the weight 24 cwt., or almost exactly 1 cwt. per horse-power output.

In the Desrozier machine the armature conductors are of copper and arranged radially, the connection between their ends, both outside and inside, being made by segmental strips, and there is as usual a separate commutator. In all these details the Fritsche machine is different, though its principle is the same, viz: that of a disc armature without iron core revolving within a multipolar field, the lines of which are parallel to the spindle. In the Fritsche armature the conductors are of iron, to reduce the magnetic resistance of the interpolar space, and they are not placed radially, but with a certain rake, by which arrangement the segmental conductors are dispensed with. Finally, there is no separate commutator, the collection of current taking place at the outer periphery of the disc. In all these details, then, the machine is quite original, and different from other disc machines. The following description is based upon the German patent specification of this machine, supplemented by some notes which the inventor has been good enough to forward to us. The specification is a very interesting document, and thoroughly German in its leading idea. It is, in fact, a complete treatise of drum winding as applied to both a cylindrical surface and the surface of a disc. Starting with the ordinary method of drum winding introduced by Herr Hefner von Alteneck for two-pole machines, the inventor shows how from this can be evolved a modified winding by placing the conductors spirally so as to avoid the necessity of end connection, how the winding can be arranged so as to obtain only two circuits though there may be more than one pair of poles, and, finally, how the shape of the pole pieces can be altered to avoid the differential action to which the spiral arrangement of the conductors on the armature would otherwise give rise. The inventor next applies the same train of reasoning to disc machines, and arrives at the peculiar form of winding represented in Fig. 3. This illustration shows the arrangement of conductors in an eight-pole machine. The rake of the conductors is such that the angle enclosed between their inner and outer ends is one-eighth of a complete circle or 45°. Thus two successive conductors come simultaneously under the influence of two neighboring poles, and the shape of the pole pieces is so chosen that no conductor is under the influence of two poles simultaneously. This is the reason for the peculiar form of the polar faces *N S*, shown in the diagram. The conductors or bars are arranged in two planes, one close behind the other. One set of bars rake one way and the other the opposite way, their outer and inner ends being joined by plates placed parallel with the spindle, the commutator segments being on the outer circumference, held apart by insulation, and having the brushes bearing directly on the rim of the armature. The current entering at the brush B_1 into the plate 11 (Fig. 3) divides between the bars, raking opposite ways, and flows successively through all the back and front bars in the direction indicated by the arrows, until it finally leaves the armature by the plate 1 and brush B_2. If the direction of the current entering the bar 11 and flowing downwards in the figure be followed, it will be seen that the current successively passes through the bars 12,13 and so on, until it reaches the set of bars marked 1, through the last of which it flows upwards and out by B_2. Similarly the other half of the current entering the bar 11, and flowing to the left, traverses successively the bars 10, 9 and so on, until the last bar 1 is reached. There are 79 bars in each set, or 158 bars in all, and the total E. M. F. is the sum of the electro-motive forces induced in the 79 bars which at any moment are in series. The bars are rigidly attached, and in metallic connection with the plates at their outer and inner ends, and are not insulated. Fig. 2 shows a complete armature, and Fig. 1 a complete 16-pole machine arranged for belt driving. The inventor claims that by the use of naked armature conductors, the possibility of the armature burning up under an excessive current has been entirely obviated; and that, in fact, this machine might be run with the armature conductors red hot without injuring the insulation. These machines are designed for very low speeds, and are specially intended for direct coupling with ordinary slow speed steam engines. The following table gives some particulars of the current sizes, all intended to give a pressure of 110 volts:—

Speed.	Current.	Output.	Armature Resistance.	Weight. Cwt.	Weight. per H. p.
180	50	5,500		28	3.8
160	85	9,400	0.060	42	3.3
160	130	14,300	0.040	56	2.9
140	200	22,000	0.025	76	2.6
140	330	26,300	0.0138	102	2.9
110	540	59,400		140	1.75

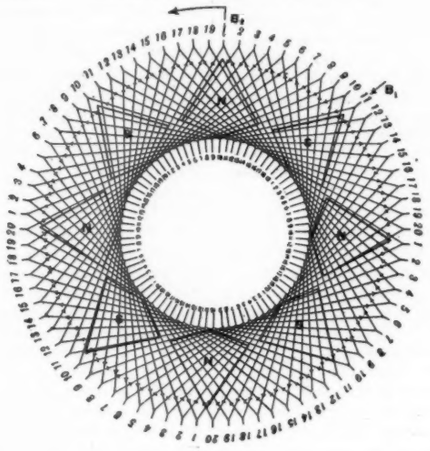


FIG. 3.—SHOWING WINDING OF ARMATURE.

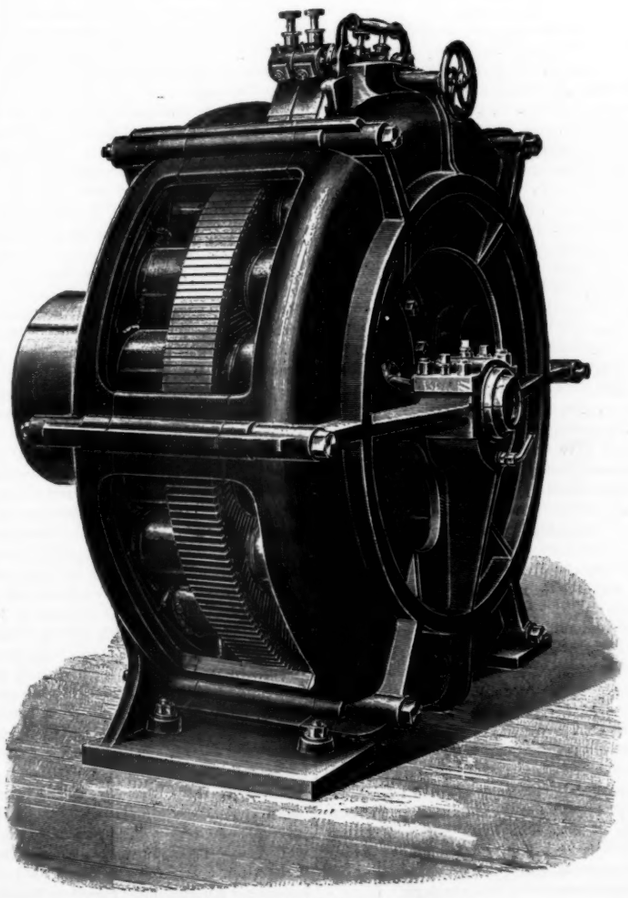


FIG. 1.—16 POLE FRITSCHE MACHINE.

South Framingham, Mass.—The Framingham Gas, Fuel and Power Company. Directors, R. H. Whitney, M. F. Farrell, H. S. Jackson, James W. O'Brien, James H. Tooker. H. S. Jackson is treasurer. Capital, $75,000, in shares of $100 each. The gas will be furnished for cooking, heating, chemical, mechanical and lighting purposes.

Pittsburgh, Pa.—The Totten & Hogg Iron and Steel Company; capital stock, $150,000, divided into 3,000 shares at $50 each; directors, Nathaniel B., George E., George A. and William C. Hogg and Robert C. Totten. Of the capital stock $135,000 was issued to Nathaniel B. Hogg for the machinery, patents, etc., of the late firm of Totten & Co.

Concord, Mass.—The Concord Electric Company, of Concord; capital stock, $20,000; T. T. Robins, president; C. A. Bowditch, treasurer; the same and W. A. Stiles, directors.

Mauch Chunk, Pa.—The Mauch Chunk Electric Light Company of Mauch Chunk; E. B. Leisenring, president; C. A. Rea, vice-president; Richard Ruddle, treasurer, and Fred'k Bartolette, secretary.

Chester, Ill.—The Chester Illuminating and Power Company, at Chester; capital stock, $100,000; to furnish light, power, transportation and water; incorporators, James B. Hockridge, Abram G. Gorden and John D. Gerlach.

Steubenville, O.—The Steubenville Gas and Electric Company, Steubenville, $300,000.

Harrisburg, Pa.—Turtle Creek Valley Electric Light Company, of Pittsburgh; capital $50,000.

Minneapolis, Minn.—The Minnesota Automatic Fire Service Company; the capital stock is $200,000.

Provincetown, Mass.—The Provincetown Electric Company; capital stock, $15,000; J. D. Hillard, president; J. A. West, treasurer; the same and T. T. Robins, directors.

Chester, Ill.—The Chester Power and Illuminating Company; incorporators, J B. Hockridge, A. G. Gordon and J. D. Gerlach. They propose to light the city with electricity.

Chicago, Ill.—Dicey Engine Improvement Company, Chicago; capital, $275,000; to manufacture engineering appliances; incorporators, E. C. Dicey, G. M. Barker, Charles H. Mitchell.

Joliet, Ill.—Joliet Street Railway Company, at Joliet; capital stock, $150,000; to construct street railways in Joliet and suburbs; incorporators, J. A. Henry, G. J. Monroe and J. W. Polk.

Chicago, Ill.—The East Chicago Iron and Steel Company, at Chicago; capital stock, $500,000; to manufacture iron and steel; incorporators, Thomas E. Dixon, Frank C. Smith and Walter D. Rose.

Framingham, Mass.—The Framingham Gas, Fuel and Power Company, of Framingham; capital stock, $75,000; R. H. Whitney, president; H. L. Jackson, treasurer; the the same and J. W. O'Brien, directors.

Springfield, Ill.—Springfield Electric Light and Power Company, at Springfield; capital stock, $100,000; to furnish electric light power and for the manufacture of electric machinery; incorporators, A. L. Ide, G. N. Black and S. D. Scholes.

Newark, N. J.—The Advance Illuminating Company, of Newark. The object of the company is to furnish electric light and power. The capital is $100,000. The incorporators are: Henry C. Rommell, Newark; George J. Dunlap, Montclair; Robert P. Bell, Newark.

San Francisco, Cal.—The George W. Gibbs Company for the purpose of manufacturing iron and steel; capital stock is $600,000, of which $2,500 has been subscribed. Directors, George W., Henry T. and Frederick A. Gibb, Edward A. Selfridge and Henry J. Morton.

Dover, Del.—The Spalding Telegraph Company. The incorporators are prominent New York and Boston capitalists. The company desires to run a telegraph by the conduit system from Boston to Washington. They ask the right to lay their conduits through the northern end of the State.

New York—The Ericsson Coast Defense Company; capital, $250,000; object, the manufacture of bombs, vessels, machinery and other appliances. The incorporators are George H. Robinson, William Williams Ericsson, F. Bushnell, Cornelius S. Bushnell and Edward S. Innet of New York.

Baltimore, Md.—The American Telephone and Telegraph Company; capital stock, $15,000. Incorporators: Edward J. Hall, Jr. of Morristown, N. J.; Melville Egleston, Elizabeth, N. J., and Archibald Wilson, Thomas E. McSherry and Wm. Taylor, of Baltimore. The company is formed to operate telegraph and telephone lines in the city and state.

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We invite correspondence from Electricians, Inventors, and the Telegraph and Telephone fraternity and those engaged in Electric Lighting, on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

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NEW YORK, APRIL 6, 1889.

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Will some of the howlers for the burial of all electric wires explain how to avoid that little disquieting element known as "retardation," which so affects the long telephone lines?

Does the public realize the meaning of the increased price charged for electric lights in the district where conduits are used? It means that no business can be conducted at a loss for any length of time, and that it is more expensive to supply electric current underneath the ground than through the air. It is also more dangerous. These little things the officious politicians will find out in time.

It is nearly time now for the member from the interior to introduce the regular annual bill in Congress to have the government run the telegraph business. When he gets ready, here's an item he may keep pasted in his hat:

England's postal telegraph system is operated at a continual loss. Last year the receipts were £30,000 behind the expenses, and to this is to be added interest on 80 millions, making a deficiency of over 1½ millions. Since 1872 the net loss of that department of the post office has been over $16,500,000.

At the meeting of the Ohio Gas Association reported in the REVIEW this week, President Wood informed the convention that his company furnished gas, arc light, and incandescent light, and stated that the combination had been a good thing for the stockholders and was satisfactory to the citizens. He said if they were to-day placed in the position they were before they adopted electric service as a part of their system, but with their present experience, they would at once go into the electric light business and would build better and more extensively. This is substantial and authentic testimony founded on experience, and is a pointer that the gas companies of the country should not be slow to appreciate.

THOSE MYSTERIOUS SUBWAY EXPLOSIONS.

Various theories have been advanced to account for the recent subway explosions in New York. It is admitted that the subway contained an explosive mixture of gases, but inasmuch as there were no workmen in the manholes where the trouble occurred and the covers were properly fastened down, the origin of the spark which ignited the gases is involved in mystery. The theory of spontaneous combustion does not receive much support from those who have for some time past been conducting a chemical analysis of the gases found in the subways, and naturally the blame is attached to the electric light cables which were laid in the ducts which exploded. The statement of the Subway Commissioners, however, to the effect that there was no current in these cables, obliges us to look elsewhere for the cause of the trouble.

It is maintained by some that a current might have been induced in the iron ducts by underground electric light wires in the neighborhood, which, under proper conditions, might produce a spark. A much more probable explanation is, that there may have been a leak to earth on one of the adjacent electri- light circuits, which found its way into the manholes through the iron ducts and lead-covered cables.

Considerable weight is attached to this hypothesis by those who have seen the havoc which is sometimes worked in telephone exchanges by leakage currents from dynamo circuits being taken up by telephone lines connected with the earth. An instance is related where the entire business of an exchange was interrupted until the ground was removed from the dynamo circuit. It is even stated that the entire telephone business of a city could be paralyzed by any evil-disposed person who was willing to erect a dynamo in some out-of-the-way cellar and properly connect it with the earth.

It is not altogether necessary to look to obscure electrical phenomena for the unfortunate spark. It could be caused by the jarring or friction of the top manhole cover caused by the passage of heavy vehicles. Too much time however should not be spent in looking for the origin of the spark, but prompt action should be taken to expel the dangerous gases by a comprehensive system of subway ventilation.

A WORD TO GAS MANUFACTURERS.

The subject which should deeply interest every gas lighting company is gradually forcing itself upon their attention, namely, the advisability of taking up the distribution of electrical energy along with that of gas. It is a question of great importance, and we are glad to see that some hundreds of gas companies have already affirmatively decided the question and gone to work practically, with a result quite satisfactory from a financial point of view. But there are other aspects to the situation. People are beginning to learn. They see that the incandescent light is just the thing needed to make interior brilliancy possible without the great discomforts of heat and foul air. They see that sanitation is capable of improvement in their illuminant as well as in their drainage. It is true that ventilation can be had to stem the tide of ill health from the poisonous products of combustion. It is equally true that no means of regulating temperature is possible in a house lighted by gas. A hot-air furnace or steam radiator can be regulated of itself so as to maintain a substantially uniform temperature. But the gas-jets are lighted in the evening and are themselves very efficient stoves, and quickly raise the temperature of a room to an insufferable degree. The waste of energy is excessive. An ordinary six-foot gas-burner will deliver per hour gas containing heat-units representing one and one-half horse-power of mechanical energy, but a small proportion of which is utilized as light. Light is all that is wanted, however, and all the heat given off is so much energy gone not only to waste but to the establishment of great discomfort. The owners of a gas plant are thus confronted by the live question, is it not better to convert their gas at the station into mechanical energy, this into electrical energy for distribution, and give consumers electric light with substantial freedom from heat and unhealthy vapors? The purifying apparatus and processes could be dispensed with and a cheap fuel gas produced whose heating energy is quite satisfactory, and would be all placed where it would do the most good. The subject is worthy of close investigation by the gas interests of the country.

A NOTABLE LABORATORY.

The electrical department of the Massachusetts Institute of Technology has become one of the most popular of the dozen different departments of this eminent institution. The corps of instruction in the special branches of the course embraces Profs. Charles R. Cross and Silas W. Holman; instructors, S. Homer Woodbridge, William L. Puffer and H. E. H. Clifford; and assistant, B. R. T. Collins. The new engine and dynamo room, which has been fitted up on the ground floor of the new building at the corner of Boylston, Clarendon and Newbury streets, is a most excellent one and a model in its way, and will no doubt tend to make the course even more popular. The steam plant (steam being brought through a tunnel from the boilers in the Rogers' building) consists of a Westinghouse automatic engine of 75 horse-power, running at a speed of 300 revolutions per minute, with driving wheels five feet in diameter. From this to the main line of shafting, running the length of the room, are two belts, the link belt being used on one side and the ordinary double belting on the other. The shaft is divided in the center, and a mechanical coupling and also a friction clutch arrangement allow all sorts of combinations of power and work, giving opportunity for comparative tests of the belting, as well as a variety of power and work tests. The main shaft is three inches in diameter, revolves at a speed of 500 revolutions per minute, and is placed on inverted hangers supported by 8"x12" timbers running the entire length of the line. This arrangement not only gives great stability, but is very convenient for examination and thorough inspection.

The dynamo plant is at present made up of an Edison machine of 150 lights capacity, a Thomson-Houston alternating machine, 500 lights capacity, a Thompson-Houston direct current, inclined coil machine of about 150 lights capacity, and a Weston 70 light dynamo. In addition to the machines already put in position, the department have several others not yet placed in the laboratory. Among these are a shunt machine now used as a motor and furnishing a few horse power to another department, a three-light Brush machine and a small series Gramme dynamo.

These machines are admirably arranged for the purposes designed, and in fact, throughout the plant, every precaution has been taken to guard against danger, and at the same time afford every facility for examination and all testing work. The arrangement of plant and planning of wiring, etc., was all done by institute men, and has been principally under the supervision of Mr. W. L. Puffer, who is now in charge, and to whom the credit is largely due. The dynamos are doing practical work in lighting a large part of the two buildings, beside furnishing current for motors, motor testing, storage battery testing, and every variety of experimental work. The wiring and connections are all in plain sight overhead, and wires cross at regular intervals to prevent trouble from induction, and the arrangement works perfectly satisfactorily. A plug switchboard of special design is used, allowing every desirable change or combination called for in experimental work. The present capacity of the board is for 27 circuits, but it can be doubled. An arrangement of pressure wires brought back to the dynamo room has been made with a suitable switchboard, so that the pressure on the mains at any desirable point can readily be told. The exhaust steam from the engine goes out doors or into the heating system of the building, an arrangement of relief valves governed either automatically or by hand accomplishing this.

The situation of the laboratory is such that a comprehensive view of it may be had without the spectator interfering in any way with the work, and without the slightest danger from either mechanical or electrical sources, and this fact, with its attractive nature and interesting features, will make it a favorite point for visitors.

PERSONAL.

Mr. C. Jay French, assistant general manager of the American Bell Telephone Company, was a New York visitor last week.

Mr. A. C. Miller, of the Fort Wayne Jenney Electric Light Company, was a visitor in New York last week, with headquarters at 115 Broadway.

Mr. Henry C. Davis, former president of the Sawyer-Man Electric Company, sailed for this country last Saturday, having been in Europe for four months. He expects to return to London in a short time.

Mr. C. J. H. Woodbury, of Boston, will receive the sincere sympathy of a host of friends over the death of his mother which occurred Saturday, March 23d. The day of his bereavement, Mr. Woodbury's residence was very badly burned and will require much repairing to make it habitable again.

ELECTION OF PRESIDENT OF THE AMERICAN BELL TELEPHONE COMPANY.

The board of directors of the American Bell Telephone Company held a meeting at the company's office, 95 Milk street, Boston, Monday of this week. Mr. John E. Hudson, former vice-president and general manager of the company, was elected president in place of Mr. Howard L. Stockton, who resigned. This is a splendid selection and places at the head of this large corporation a gentleman long identified with it, and thoroughly familiar with the work of the company.

DEATH OF MR. FRANK SHAW.

Mr. Frank Shaw, inventor of the Law telephone and telegraph system, died at his residence in New York, Saturday, March 23. Mr. Shaw was a successful electrical inventor, and left an estate of $100,000. A few years ago—less than ten—he was a battery man employed in the fire department of New York. His invention of the Law system for telephone exchanges made him a rich man. At the time of his death he was the electrical engineer of the Law Company. His many friends will deeply regret to hear of his death.

THE NEWS.

Interesting Electrical Information Sent in by our Correspondents.

OUR BOSTON LETTER.

New Products.—The Eastern Electric Cable Company have just put on the market a new product in the shape of an insulating tape, known as the Clark joint gum for making waterproof joints. It is a very adhesive tape put up conveniently in strips 12 inches long and ⅝ inches wide, and shows remarkable homogeneity when rolled or pressed together. The tape is now furnished in one-half pound boxes and is meeting with a ready sale. Another new product of the Eastern Electric Cable Co. is the well known Clark wire with a white outside finish for ceiling cleat work. This step was rendered necessary to supply the demand following the recent decision of the fire underwriters, calling for waterproof and moisture proof wire in all loops or drops into buildings and inside all buildings. That Mr. Clark and Mr. Eustis can successfully bring out these new products in the face of the fact that their regular business from January 1 has been double that done in a corresponding time last year, speaks well for their energy and the capacity of the works.

Returned Home.—Mr. L. W. Burnham, general manager of the Electric Gas Lighting Company, who went West after the Chicago Convention closed, has returned home looking much improved in health by his Western journey, and can now devote his entire energies to the business of the company. Mr. Burnham didn't find a "cold day" out West, certainly not in a business way, and reports that for several weeks after the Chicago Convention the Western weather was so warmed up that no overcoats were necessary.

A Significant Showing.—There are now on the ocean, or about arriving in France, over 20 miles of Simplex insulated wire, manufactured by the Simplex Electrical Company, of this city. This wire is for wiring the inside of a considerable portion of the Paris Exposition buildings, and the company has another order yet to fill for the same destination.

Electric Club Meeting.—The regular monthly meeting of the Electric Club will be held this evening, at the rooms, 7 Park street. The Club buffet is about completed and will give an added attractiveness to the comfortable new quarters.

A Narrow Escape.—An accident occurred to Thomas N. Covell, president of the Robinson-Foster Electric Motor Company, Sunday afternoon, while at the works of the company. In turning the buggy around the horse backed over the wall into the pond, Mr. Covell was thrown into the water, and might have been drowned but for the timely efforts of a friend in rescuing him.

New Factory in Operation.—The Bernstein Electric Company's new factory in South Boston is finished, the machinery and appurtenances about all in position and nearly ready to start up. Within a fortnight the company will begin to fill the numerous orders for its series incandescent lamps that have accumulated during the interruption to business caused by removal from the old factory to the new.

Constantly Improving.—Mr. Bennett, of the National Telephone Manufac uring Company, is never so happy as when overcoming some little difficulty, or making some improvements in his telephone instruments, and to the fact that he has a faculty for doing just these things, the success of these instruments is perhaps largely due. During the last of the week a new device for a call in connection with the system was put into practice, and proved a success from the start. The instruments are finding a market in all parts of the country.

Electrical Subway Commission.—The legislature committees on cities and mercantile affairs have been considering legislation for the establishment of boards of electrical subways in the cities of the State and for converting overhead to underground systems. H. L. Harding appeared for the Citizens' Association of Boston, G. A. Bruce and P. A. Collins for the New England Telephone Company, E. W. Burdett for the Boston Electric Light Company and Citizens' Electric Light Company, Harvey H. Shepard for the Middlesex Electric Light Company, Hon. W. E. Russell for the Cambridge Electric Light Company, H. H. Fairbanks for the Worcester Electric Light Company, Hon. R. A. Southworth for the West End Railway Company, and Fred. H. Williams for the South Eastern Telephone Company. No definite decision has been reached.

Electric Exchange.—The following notice has been issued by the secretary, Henry B. Cram: "The annual meeting of the New England Electric Exchange will be held at the rooms of the Boston Electric Club, No. 7 Park street, Boston, on Monday, April 8th, at 2 o'clock, P. M. As at this meeting the Exchange will elect its officers for the ensuing year, and will take such action as may be deemed necessary to continue and increase its usefulness, a full attendance is especially desired. In addition to the regular business, there will be a discussion of the 'Insurance Requirements for Electric Lighting Stations,' and a paper will be read by Mr. M. J. Perry, of Providence, upon 'Economical Steam Plants for Electric Lighting Stations.' If you are not a member of the Exchange you are cordially invited to attend this meeting and become a member, if eligible. Prompt attendance is requested, as the meeting will be called to order at 2 o'clock without fail."

More Elevated Railroad Petitions.—The street railway committee has opened the hearing on the petition of Frank M. Ames, John Shepard, William S. Lamson, B. W. Currier and Nathaniel J. Rust for incorporation as the Boston Electric Elevated Railway Company, with power to erect, equip and maintain a system of elevated railways, with cars to be propelled by electric power and running between such points in Boston and its vicinity as may be specified in the act of incorporation. T. W. S.

Boston, April 1, 1889.

OUR CHICAGO LETTER.

Telephones in Politics.—The telephone question has been drawn into politics in Chicago. The present Mayor (Roche) is before the people for re-election, is arraigned by the opposition, for approving the telephone ordinance awhile ago. The *Tribune* (Roche) publishes a list of aldermen who sustained the mayor when an appeal was made to reconsider the vote, showing 29 against 11.

Statements.—Then the *Herald* (opposition) says: "The Bell Telephone Company had no right to do business in Chicago. It was entirely at the mercy of the City Council. That body might have imposed any reasonable terms upon it that justice seemed to demand. The company would have been compelled to accept those terms or retire from business."

Facts.—The facts are that while the company could have been prevented from stringing more wires, it could not be prevented from using what it had. It held the fort; and the fact that it was anxious to extend its reseau of wires and its business, made it willing to accept a compromise which gives to the city a very nice little annual sum, a sum so large that it was feared at one time the company would refuse to submit. The council and the mayor won the fight in the interests of the city and the taxpayers.

More Lights.—The Council of Sheboygan, Wis., has passed an ordinance which gives an electric light franchise to A. F. Lieberman.

Missouri Telephones.—The Missouri House of Representatives passed Dempsey's Telephone Bill on the 27th. The provisions of the bill limit rentals in St. Louis and Kansas city to $48 per annum. In all other towns the maximum shall not exceed $36. The bill will come up in the Senate in about a fortnight.

Red Books.—Members of the convention will remember what were known as the red books of the N. E. M. Company, of Eau Claire. A similar piece of electrical literature from the same source has just made its appearance here. Charley Kammeyer brought it. It is headed in the original language of that part of the country, "*suum cuique*," which shows the dire needs of a schoolmaster in those parts, for it certainly is the very worst spell for "sue 'em quick" one could possibly imagine. C. C. H.

Chicago, March 30.

SOUTHERN ELECTRIC NEWS.

New Electric Light and Power Company.—The North Carolina Power Company, a corporation chartered at the recent session of the General Assembly, have organized with a strong board of directors, and gives promise of a large business. This company has bought out the Wilmington, N. C., Electric Light Company, and will erect a handsome building and put in a large steam plant, greatly extending the present capacity. The company has already placed an order with the Thomson-Houston Electric Company, which system has been used with great satisfaction.

Damages for an Electric Stroke.—In Lynchburg, Va., on the 13th inst., the corporation court rendered a verdict in favor of Samuel C. Shelton against the Richmond & Alleghany Railroad Company and the Piedmont Electric Illuminating Company, for $5,300 damages, for injuries sustained while regulating the electric wires. Shelton was badly shocked, and claimed that it was caused by the close proximity of the railroad company's telegraph wire to the electric wire.

Electric Light Work Projected:—G. H. Hughes and others, of Morganfield, Ky., contemplate starting electric light works and desire information as to costs.

The City Council at Point Pleasant, Va., has contracted for electric lights.

Efforts are being made to establish an electric light plant at Athens, Tenn.

The city of Camden, Ark., has granted franchise for electric light work and street car line. E. A. O.

Charleston, S. C., March 23d.

OUR PHILADELPHIA LETTER.

A. & S. Engines.—Mr. Gardiner C. Sims, of the Armington & Sims Engine Company, was in Philadelphia recently, witnessing the starting of the large A. & S. engines at the Edison station.

Compound Engines.—M. R. Muckle & Company have sold in one order to Claus Spreckles, for driving his new sugar refinery, sixteen 60 horse-power Westinghouse compound engines. They have also sold him quite a lot of electric lighting machinery.

New Central Station.—Armstrong & Connor, the electrical contractors of 115 N. Sixth street, are putting in a large central station in Danville, Pa., for arc lighting.

New Elevator.—Mr. W. A. Stadelman is making some extensive experiments with a direct running elevator at his residence in Bala, which does away with a lot of gearing and belting so objectionable to most elevators.

Electric Power.—Chadbourne, Hazelton & Company have just closed a contract with the East Reading road for an additional car equipment, to be ready by May 15. They have also installed several motors in Philadelphia within the last week, to be run from the new Edison station on Sansom street.

A Pleased Electric Light Man.—Mr. Charles A. Bragg, of the United States Lighting Company, reports business quite good notwithstanding the fact that we had a "blizzard one year ago." W. H. C.

Philadelphia, April 1, 1889.

OUR WASHINGTON LETTER.

Underground Conduits for Arc Wires.—The United States Electric Lighting Company has been granted permission to lay about six miles of Lake terra cotta conduit in various streets in this city, in which to place new lines to take the place of those now operated overhead, which must be removed before September 30th, 1889. This permit does not authorize any extension of existing lines, which is prohibited by law, and is revocable at the pleasure of Congress, without compensation. The company will be entitled to 60 cents per light per night after all their wires are placed underground. The permit has been issued in opposition to the advice of Commissioner Raymond, who recommended additional conditions, giving the commissioners the right to exercise control over the electrical conductors within the conduits and to purchase the lines at any time should the District decide to undertake the business of electric lighting. The United States Company has heretofore officially expressed to the authorities its entire lack of confidence in the success of any known system of underground lines for arc lighting, and declared that the danger from electric light wires is greatly augmented by placing them underground, and that there is increasd liability of shocks, explosions and fire when so placed. They also state that they have been unable to discover any cable that is practicable for arc lighting, and Major Raymond is naturally averse to authorizing the company to construct lines for public use which it believes to be dangerous and unserviceable, without reserving the right to prescribe means of overcoming these serious difficulties.

The Government and Electric Light Contracts.—The plan for lighting the House of Representatives did not succeed. There has been some curiosity to know why the committee asked an appropriation of $125,000, when the Edison Company offered to install the required plant for about $50,000, and the architect needed less than $5,000 to prepare a place for the machinery. While Sam. Randall is chairman of the Appropriations Committee such conundrums as this have to be answered, and lighting companies will probably earn all the money they get out of government contracts. The Sawyer-Man Company is still waiting for its pay for the Senate plant, which has been running steadily during the session just ended—and it has not killed anybody either—although it is stated that all the Senators (except Riddleberger) have felt a daily dread of being alternated into eternity by getting hold of a spigot to draw a glass of water. After the alarming cautions given by the Edison Company last November, the architect recommended the appointment of a commission to investigate the question of dangers attending the use of the apparatus, and the matter was referred to the Committee on Rules, which still has it in charge. Meanwhile Vice-President Ingalls started an inquiry on his own account, and Commander Bradford, of the Navy, has been investigating the subject for him.

The Pan Electric Telephone Situation.—The Pan Electric war has been transferred to Memphis, Tenn., where the books of the concern are supposed to be, and where the testimony of Senator Harris, Casey Young, Col. Looney and some other persons, is to be taken. Both parties are dead in earnest. The evidence, when published, will make an interesting addition to the immense mass of literature already produced in this famous controversy. There appears to be three sides to the case. The ex-attorney general and his associates take the position that, out of the long list of inventions assigned to them by Rogers, the telephone was the only thing of value; that the patents relating to it were transferred to the Pan Electric Telephone Company, and that, if Rogers has any claim at all, it is against that corporation and not against the individual members of it. They would now be glad to transfer back to Rogers all his patents, and get rid of the whole business. Rogers, however, insists that these financiering statesmen agreed, not merely to introduce the inventions that were completed and ready for practical use, but to investigate and test the much larger number of incomplete inventions, and to perfect and introduce such as should prove to be valuable. He declares that they failed to carry out this agreement, and that, having never rendered any service whatever, they are entitled to no share of the receipts, and he now demands all the money received by his associates, all the stock in the various companies which they organized, or agreed to organize, and the return of all his patents. The disinterested view of Pan Electricity is that Professor Rogers put forth a most remarkable statement of what he had done; what he expected to do; what he believed somebody else might do, with much speculation as to the large profits to be made by the realization of this dream of possibilities, and then, with the utmost candor and an entire absence of "Keely-motor-secrecy," warned everybody not to invest in his scheme until they had brought the best electrical experts to investigate it, and had satisfied themselves of its value. Had the gentlemen now defending his suit followed the advice of experts, the Pan Electric Company would probably never have been heard of. After they had gone into the undertaking they never appeared to have any confidence in its propriety or success, except when there were funds to be divided, and the receipt of remittances and their interest stopped together.

A Former Telegraph Operator Rewarded.—Thomas H. Sherman, who was for many years an operator in the Western Union office in this city, has just been appointed U. S. Consul to Liverpool, where his pay will be $13,000 or more per annum. Since leaving the telegraph service he has been Mr. Blaine's confidential secretary and a clerk in the State Department. He is most thoroughly competent to fill the place to which he is assigned. G. C. M.

Washington, March 30, 1889.

OUR BELGIUM LETTER.

Increasing Business.—The business in the installation of electric lights has been constantly increasing during the last six months. A great number of manufactures, iron works, sugar refineries and other industries have adopted the electric light. The systems used here were seen at the Grand Concours Exhibition of last summer, and comprise the Brush, Thomson-Houston, Schukert, Edison, Lahmeyer and the Accumulators. We have nothing to say about the exhibition, nothing particularly new and interesting being exhibited in the electrical department, except, however, the Thomson Electric Welding Machine. Our important firms generally should plan to take part at the Exposition Universelle at Paris this year.

Notable Installation.—Amongst the plants installated last year, I must point out the salon of the Comte de Flandre, the King's brother. This is very well finished and artistically installed, presented by the company L'Electrique. The Gare du Nord, the most important railway station in Brussels, is now lighted by arc lamps supplied by the Société Industrielle d' Electricité of Brussels. This contract was awarded after competition to the lowest bidder, which in the electrical business is certainly a serious mistake. The dynamos are of Lahmeyer system and arc lamps of Iamar G. Chabot, and can't be considered first class, and the light is notably inferior to what it was expected.

Storage Batteries Popular.—The secondary batteries manufacture is growing in great favor in Belgium and France, and the Julien accumulator remains far ahead of all others.

Electric Railways.—Electrical traction continues to prove satisfactory. During the exhibition at the Great Concours, since June to November, the daily service was excessively hard, and when horse cars were overloaded by the multitude of passengers, and obliged to run slowly, electrical cars equally loaded were making their regular trips with the greatest satisfaction. Several new electrical cars will be in service in the spring.

An Important Contract.—The municipality of Brussels has resolved that all the principal districts of the city shall be lighted by electricity, and the current supplied to every customer. The greatest liberty is allowed for the system; every one is free to propose the system he considers as the best. This is the most important plant to be established in Belgium. As the estimates includes the supply of dynamos, engines, wiring apparatus, lamps, etc., this large business is worth the attention of the large manufacturers. I am able to furnish any information desired, and I will gladly answer any inquiries coming from the readers of the REVIEW addressed to the New York office. A. A.

Brussels, March 10, 1889.

Telephonic News

⁂ The Anniston, Ala., Telephone Exchange is under excellent management in the person of Manager J. F. Hoffar.

⁂ The Hamilton telephone bill reducing telephone rates in the large cities of the State of New York was defeated in the Assembly last week. It is not likely that any bill of this nature will be passed this session.

⁂ At a meeting of the directors of the New England Telephone and Telegraph Company held March 27th, a dividend of 75 cents per share was declared payable on Wednesday, May 15, 1889, to stockholders of record at the close of business on Friday, April 5, 1889. The transfer book will be closed from April 9th to May 9th, 1889, both days included.

⁂ Mr. F. A. Gentry, of Atlanta, Ga., inspector and contractor for the Western Union, is in Pensacola, to see what will be the probable cost of purchasing and transporting cedar poles in Punta Rassa. The company is thinking of taking up its cable between Punta Rassa and and Key West and running it down along the coast to a point opposite Key West. The distance between Punta Rassa and Key West is 120 miles.

⁂ At a recent meeting of the Boston Council a communication was received from J. B. Gomez, in which he offered, while abroad, to make detailed and comprehensive reports, with plans and views of the methods and systems of placing telephone, telegraph and electric wires underground, in France and Germany, for the use of the Boston city government for the sum of $875, the reports to be furnished not later than October 14 of this year. It was referred to the committee on electric wires.

⁂ Henry Russell, Edward J. Slattery and Charles E. Arnold, have filed articles incorporating the Champlain Telegraph Company; capital stock, $10,000, divided into 100 shares. The stockholders are: Henry Russell, 20 shares; E. J. Slattery, 20 shares; C. E. Arnold, 20 shares; Dr. S. B. Ward, 5 shares; Ferd. W. Chase, 10 shares; Appollas A. Smith, 10 shares; Milo B. Miller, 10 shares, and Isham Bros., 1 share. The lines will extend from Plattsburgh to Loon Lake, St. Regis Lake, Saranac Lake and Lake Placid, in Clinton and Franklin counties.

⁂ Telephone subscribers in Connecticut are interested in the statement made at a meeting in New Haven of the stockholders of the Southern New England Telephone Company, that it was proposed to make a considerable increase in telephone charges. President Tyler submitted the report of the directors, which explained why no dividends had been paid since July 1, 1888. Much money had been spent in improvements and for repairs consequent upon the blizzard of a year ago, the total outlay being $200,000. Long distance circuits, improved copper wires and new transmitters had been provided. To meet the expenditure, the company's earnings had been used. The usual dividends had been six per cent. to stockholders and three per cent. to the Bell Telephone Company. The latter company had agreed to contribute $23,000 toward improvements. The sum of $83,000 would be needed the coming year for improvements. No dividends would be paid before April, 1890. An advance in the telephone rates would be necessary to bring the revenue up to the point to pay the usual dividend. Mr. Tyler said the advance in rates would be from 40 to 60 per cent. in the present. He anticipated strong objections and for a time there would probably be a war between the subscribers and the company. The ultimate result, however, would be advantageous and satisfactory to the stockholders.

The Western Electric Building.

The completion of such a magnificent factory building as that just finished for the Western Electric Company at the corner of Greenwich and Thames streets, is a notable event not only to to those interested, but to the public at large, as an illustration of the remarkable and substantial growth in the electrical business in the last few years. The building just completed is acknowledged the best factory building in the city of New York, if not in the United States, and is a fitting monument to the business enterprise and indefatigable industry of the Western Electric Company. But unlike many monuments, this does not mark the company's resting place, but is, rather, to be a bee-hive of labor, wherein the enormous manufacturing and supply business of its New York branch is to be carried on.

The building, which was designed by Architect Cyrus L. W Eidlitz, has a frontage of 119 feet on Thames street, and 87 feet on Greenwich street. The accompanying illustration gives an excellent idea of its outside appearance, and in that regard it need only be added that its material is the "Telephone" pressed brick furnished by the Perth Amboy Terra Cotta Company.

NEW FACTORY OF THE WESTERN ELECTRIC CO.

On the ground floor of the building on the Thames street side is the boiler plant, consisting of three Babcock & Wilcox tubular boilers with a total capacity of 470 horse-power; two of 170 each, and one of 130 horse-power. The damper regulator has been installed as a necessary adjunct. Mentioning the name of the makers of these boilers is sufficient guarantee of satisfaction in this department. On the same floor is the engine room, wherein the main part of the steam plant is located. This consists of two Russell engines of 175 horse-power each, furnished by the well-known firm of engine manufacturers, Russell & Co., of Massillon, Ohio. The engines are of the automatic cut-off, high speed type, and may be worked together or entirely independent of each other. Two Wheeler & Tappan pumps are in use for boiler feed and house purposes, and a large feed water heater.

A small Russell engine of 20 horse-power is used independently for the incandescent lighting, and can be connected with the freight elevators. The heating of the building is to be accomplished by hot air raised to a required temperature by contact with steam coils in the basement, and then blown through pipes to all parts of the building, no steam pipes, except for special purposes, going above the first floor. The cold air supply comes down an immense shaft direct from the top of the building, insuring pure air and plenty of it, both winter and summer. A large Sturtevant blower is used to effect this air circulation, and is run by a separate 25 horse-power Sturtevant engine. The exhaust steam is used in moderate weather to heat the pipe coils, but should this prove insufficient in extremely cold weather, live steam will be turned into them. The entire steam plant is in charge of Mr. Thomas Kershaw, a most competent engineer. Before passing up stairs, a glance should be given to the various means at hand of accomplishing this ascent. There are three elevators in the building, two intended for freight and one as a passenger lift, all built by Crane & Co., of Chicago. The freight elevators are run by belts from the main shafting, but that intended for passengers is operated by a separate engine made by Crane & Company, placed at the bottom of the shaft. Beside these, a spacious stairway, constructed in a separate shaft which can be entirely shut off from the rest of the building, runs up to the tenth floor and even continues through a skylight to the roof. This stairway is entirely fire proof, being built of iron and slate. Opening on the second or street floor are two large entrances, the one on Thames street being the main entrance, while that on Greenwich is intended for the employés, etc. The Thames street entrance leads directly through a handsomely tiled hallway to the passenger elevator. On the right of the door is the retail store of the company where excellent facilities are afforded for the transaction of the business of this department. On the left is the dynamo room, wherein are situated four 45 arc light dynamos and two incandescent dynamos, one of 250 and the other of 350 lights capacity, and all Western Electric Company apparatus and in charge of Mr. Keefer. Here also are the friction clutches to effect the necessary couplings of the engines, etc., though each floor has its own clutch by means of which it can be entirely independent of the remainder of the factory. A unique feature is the employment throughout the building of ropes, manufactured by the Rawhide Manufacturing Company, of Chicago, instead of belts, all the line shafts being so driven. The clutches, drums, shafting, etc., were all furnished by the Link Belt Manufacturing Co. of Chicago. The remainder of this floor is taken up by the nickel plating department and the shipping department, both in well lighted quarters. The third floor, Greenwich street front, is a capacious storage room, and the carpentry and finishing shop occupy the remainder of the space. The fourth, fifth, sixth, seventh, eighth and ninth floors are used generally for manufacturing purposes, store rooms, stock rooms, etc. Fire proof vaults of ample size are situated upon every floor, while the building itself is also fire proof, iron beams and brick arches laid with concrete, being used throughout. The partitions are all tiled and doors of iron. Wash and toilet rooms handsomely finished and fitted with the latest sanitary plumbing are situated on every floor. The elevator doors are of corrugated iron and can only be opened from the inside. From the sixth floor up there are windows on three sides of the building giving an abundance of good light, while the three upper stories have light and air coming from all sides, and some of the most magnificent views the city affords. The tenth or top floor is used by the magnet winding department on the Thames street side, while the sides toward the river and bay are occupied by the draughtsmen and general officers of the New York branch of the Western Electric Company. The office rooms are very handsomely fitted up with antique oak, partitions of the same sub-dividing them for the division of the clerical forces. Each man has the use of a capacious locker solely for himself.

The private offices of President Barton and Mr. H. B. Thayer, manager, are on this floor and are models of taste and convenience, in which may be seen the highest development of the various branches of electrical engineering.

The Western Electric Co. are the manufacturers of the telephones and transmitters and other apparatus of the American Bell Telephone Company, domestic applications of electricity in infinite variety, and the latest devices in electric lighting, electro-metallurgy and the electric transmission of power. The department of electrical testing instruments is particularly complete, and comprises nearly everything electrical in the domain of physics.

From an examination of the telegraphic department it will be seen that this company is prepared to maintain its excellent reputation for the manufacture of fine duplex, quadruplex and multiplex telegraph apparatus, and everything which goes to make up a complete telegraphic system.

The building will be provided with completely appointed electrical, chemical and photographic laboratories, in charge of a competent corps of experts which has recently been augmented by the accession of Mr. George A. Hamilton, of the Western Union Telegraph Company. An extensive library of scientific books is conveniently located for the use of the various departments. Speaking tube telephones throughout the building which together with local and long distance telephones furnish unexcelled facilities for the prompt despatch of business.

To insure the harmonious working of such an all-embracing concern Mr. Thayer is surrounded by a staff of specialists in the various departments. Mr. M. H. Landon, who has had a life long experience in banking and corporation affairs, is in charge of the financial department, Mr. Irving W. Loveridge looks after the general office business, and Mr. J. J. Carty has charge of the switchboard department and all matters pertaining to the working of telephone exchanges.

By means of a private telegraph line Mr. Thayer is in constant communication with the president, Mr. Enos M. Barton, who is the guiding spirit of the company, and who makes his headquarters at Chicago. The Chicago factory is even larger than the New York branch. With an extensive house at London, manufactories at Antwerp and other European cities, and agents all over the world, the Western Electric Company holds a commanding position in the field of electrical industry.

The view from their windows has to be seen to be appreciated. Staten Island and the Bartholdi statue form a background of the picture, in whose foreground is a constantly changing panorama of marine views.

From the roof, the view is even finer, embracing as it does nearly the entire city, and extending north, south, east and west. Altogether a more interesting and profitable hour could hardly be spent in this city, than in a tour of inspection over this magnificent new factory of the Western Electric Company.

Telephones vs. Electric Motors.

The war between the Telephone Company and the Omaha and Council Bluffs Bridge Company's line, and the Thomson-Houston electric concern is becoming merry and interesting. At Omaha, the Nebraska Telephone company has commenced suit against the electric motor companies, in the district court for an injunction against the erection on or along any of the streets in Omaha, of wires parallel to, approaching or crossing the wires of this corporation, from operating any such wires for electric lighting, motor or other purposes in such a manner as to prevent, obstruct or interfere, by induction contact, leakage or in any other manner the operations of the telephone company's wires, instruments or business.

After reciting at considerable length the objects of the company the telephone people say that in Omaha they have about 1,400 subscribers and 1,000 miles of wire, that in the transaction of its business, they answer and make connections for 15,000 calls a day and that Omaha is placed in connection with Council Bluffs through this means fully 300 times daily. The connections with other towns in Nebraska and Iowa amount to something like 7,000 each month. They also aver that the telephone business of all these cities, towns and states has become so necessary that any interruption causes immediate and serious disturbance, and damage to business. It is further claimed that these several motor and electric railway companies are conspiring to purposely injure the plaintiff's business by preventing the proper operation of its lines, by placing along many streets in both Omaha and Council Bluffs certain wires over which are conducted heavy and powerful currents of electricity in such a manner as to interfere with and at times absolutely prevent the operation and use of the telephone wires and instruments. It is stated that this interference comes from the setting up of the induced currents caused by the wires running parallel and coming in too close proximity to each other. The petition further says that on the morning of March 21, by the whole telephone business was interrupted, connections were made impossible by reason of the opposition wires coming into contact with the telephone wires and burning out a number of instruments. A number of allegations relative to conspiracy on the part of the defendants, damage which may be expected and various other things are presented.

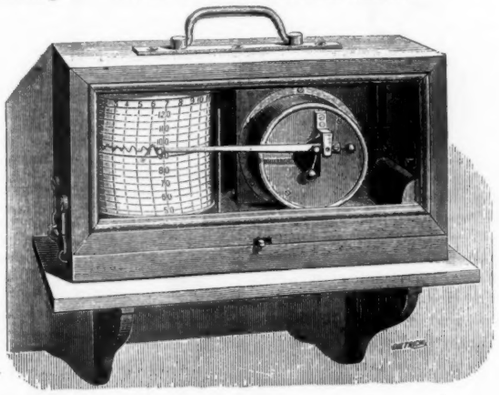
The Richards Registering Voltmeters and Ammeters.

For the economical working of a central electric light station, it is very important to obtain a record of the output during the whole time the station is at work, and this may be done by looking up indications of ammeters and voltmeters at stated intervals, or, better still, by letting these instruments write their own record. MM. Richard, the well-known makers of registering meteorological instruments of Paris, have recently brought out a set of registering ammeters and voltmeters, and some of these instruments are now in use at the new Edison station in the Palais Royale, and have previously been installed in the central station at Pau. We illustrate the registering voltmeter used at the Palais Royale. The indicating portion of the instrument is an ordinary voltmeter of the Hummel type, the pointer of which is provided with a pencil tracing a line on a strip of paper mounted upon a metal cylinder, which is slowly revolved by clockwork. The superintending engineer, by the inspection of the paper as it is delivered to him by the attendant at stated times, can thus see at a glance whether the proper pressure has been maintained during his absence, and it is interesting to note that any deviation from the normal pressure is found to correspond in point of time with variations in the steam pressure, a registering steam gauge being also in use at the station. MM. Richard, the makers, claim that their registering voltmeter indicates as small as one or two per cent. of the normal pressure. —*Industries.*

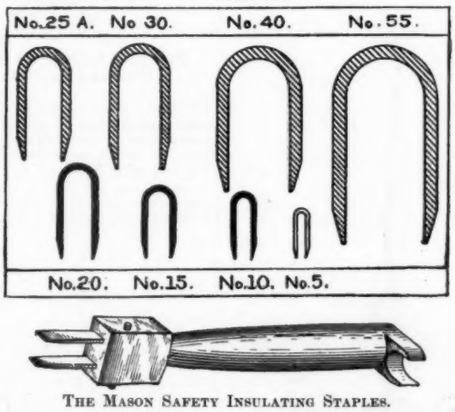
Safety Insulating Staples.

The accompanying illustration shows the new safety insulating staples in various sizes, manufactured by Mr. A. F. Mason, of 620 Atlantic avenue, Boston. The idea of making staples of an insulating material is certainly a good one. The objections to the use of iron staples are many, among the more important being the danger of cutting the insulation either by the immediate action of the driving blow or subsequent gradual pressure on the compressed and somewhat flexible wrapping. Consequent leakage, either to ground or to the opposite pole, over the surface, or through the mass of partially conducting supports, or by direct contact of the staple with a ground or a conductor. Also consequent ingress of moisture, and resulting breakage or corrosion of the copper. Then there is danger of cutting or fracturing of the conductor itself by direct contact or pressure of the staple, and consequent reduction of its carrying capacity, even to cutting entirely off, and electrolytic action set up between the copper and iron by pressure of moisture, and tending to transfer a portion of the copper through the covering and deposit for some distance around the staple. This action would result in eating away the wire (finally to a needle point) heating the reduced section until it melts and arcs, with a probability of setting the surroundings on fire.

The insulating staples largely do away with the foregoing objections and possess positive advantages of their own. Among them may be mentioned the following: Impossibility of injury to insulation. Reinforcement of the insulation in contrast with opposition to its protective power and discouragement of leakage. General avoidance of all difficulties accompanying metal. Adaptation of ornamental mouldings and other forms of support. The staples are put up in boxes of one hundred, ten boxes in each package and are made in black, gray and red. Separate driving tools adapted to each sized staple are also manufactured. The staples will immediately recommend themselves for use where electric light conductors are run on mouldings, for telephone or messenger wires, in mouldings, on walls or switch-boards, for telegraph wires in towers and offices, for burglar alarm, annunciator and all other low pressure wires within the walls of buildings and especially in basements and places liable to moisture, and for electrical instruments of all kinds, especially where high pressures are to be employed.



THE RICHARDS REGISTERING VOLTMETERS AND AMMETERS.



THE MASON SAFETY INSULATING STAPLES.

The Telephone and the Potato.

[*New York Sun.*]

Frightful extortion is practised on the community by the telephone companies.—*Albany Express.*

Well, well, that is a hard case, to be sure. But, if the telephone is extortionate, why not treat it as you treat a potato merchant who charges too much for his pototoes? Don't whine and snivel about it, but stop dealing with him. And, if the telephone is too dear, let the telephone slide.

"Texas Siftings" Reports a Meeting of the Board of Electrical Control.

Regular meeting of the Board of Electrical Control, Mayor Grant in the chair.

Mayor Grant (to an officer of the electric light company, who is summoned before the board)—Has your company yet complied with the law requiring them to put their wires in the conduits?

Electric Light Man (innocently)—What conduits?

Mayor—The conduits laid underground to receive them?

E. L. Man (surprised tone)—Have they been laying conduits?

Mayor (sternly)—You know they have.

E. L. Man (suddenly recollecting)—Oh, yes, seems to me I did hear something about it last summer.

Mayor—Your company has promised repeatedly to bury the wires.

E. L. Man (with a puzzled look)—Bury what wires?

Mayor (impatiently)—Your electric wires, of course.

E. L. Man—Bury them before they are dead?

Mayor (with rising indignation)—We'll have no more trifling in this matter.

E. L. Man—I never trifle with an electric wire, especially when it is alive, your Honor.

Mayor (consulting his notes)—Over a year ago you were given 60 days to put your wires underground. Why didn't you do it?

E. L. Man (after reflecting)—I think it rained.

Mayor—Then your time was extended 60 days more. Why wasn't it done then?

E. L. Man—Why wasn't what done?

Mayor (emphasizing each word by a tap of his pencil on the table)—Why—didn't—you—put—the—wires—under—ground?

E. L. Man—Oh! why didn't we? Well, we didn't know that they wanted to be put underground.

Mayor (getting mad)—We'll have no more fooling; the poles must come down.

E. L. Man—What poles?

Mayor—Don't your company have poles?

E. L. Man—Oh, yes. Now and then one, more for ornament than anything else.

Mayor (getting ugly)—Well, if those poles are not down and the wires underground in 30 days, I will know the reason why.

TELEGRAPHIC

.... In the House of Commons, Postmaster General Raikes has announced that the government intended to lay a submarine cable between Bermuda and Halifax.

.... During a heavy thunder storm last week a flock of wild geese flying over Gonzales, Texas, was struck by lightning and 78 were killed. They were picked up by boys and sold on the streets for ten cents each. Some of them were badly torn by the electric current.

.... An offer has been made by the California Electric Light Company to construct a fire alarm system for Alameda, Cal., costing $6,700, and take in payment bonds of the city of Alameda, voted for at a special election, and which it has hitherto been impossible to sell.

.... Mr. Wanamaker has a special telegraph wire running from his business establishment in Philadelphia directly to his office in the Post Office Department. By this means he is kept informed of what is being done in Philadelphia, and can be consulted at any moment.—*Washington Star.*

.... At Walla Walla, W. T., the city council has adopted an electric fire alarm and police system, and authorized additional policemen for day service, C. B. Hopkins, of Colfax, agreeing to put in the electric system for $800 bonus and $30 a month rental, to be ready for operation by May 1.

.... Two bids for putting in an electric fire alarm system were presented at Spokane Falls, W. T. W. S. Norman offered to put in a complete Gamewell system for $3,978. H. K. Harrison of Boston, representing the Stevens system, offered to put in a complete system for $2,000. Chief Witherspoon has recently been in correspondence with officials of several Eastern cities where the Stevens system is in use, and has received a number of communications highly endorsing it. The bids were referred to the committee on fire and water.

.... Little Johnny Hummel, aged 10 years, is one of the most remarkable prodigies in the United States in telegraph work, says the N. Y. *Sun*. Monday the boy entered the large railroad office at the Reading railroad station and was introduced to the chief operator and his men. Johnny is the son of Chas. Hummel, an expert telegraph operator at Perkiomen Junction. The last few years he has been quietly perfecting the little fellow in the art, and Monday he carried the boy to Reading to show what he could do. The boy is so small that an operator's chair was too low for him, so he stood at one of the tables containing the instrument of one of the heaviest wires on the line. Johnny very coolly received by sound three long messages from Philadelphia without a break, and made as legible a copy as any man in the office could do. His performance was voted as simply wonderful.

.... "The tendency of this electrical age," said a metropolitan philosopher in the hearing of the *Sun*, "is toward the destruction of polite and chivalrous customs of all kinds. For instance, take the self-closing door. How can we expect a youth of the twentieth century to be a model of good manners when we do those things which tend to inculcate proper conduct by machinery? A boy from a primitive country town comes to New York and goes into an office where they have the self-closing door. He repeatedly tries to shut the door after him, but the self-closing arrangement, which works slowly and won't be forced, balks him and he naturally loses the noble instinct of closing the door behind him. That is only the beginning of his demoralization. After a while he falls a victim to the habit of not giving his seat up to a lady in a crowded car, substitutes the abrupt interrogatory 'what?' for the respectful 'sir?' alludes to his father as the 'old man,' and waxes prosperous."

Electric Power

* * The Martha's Vineyard, (Mass.) Street Railway Company will erect an electric road using the overhead system of the Thomson-Houston Company.

* * It is stated that a company has been formed to run electric cabs over the asphalt pavements at Washington, D. C., and that it will have its cabs in service in a few months.

* * At New Berne, N.C., the Fair Association have purchased the electric light plant recently installed by the Schuyler Electric Company in the exposition building of the association.

* * The stockholders of the Wilmington City Passenger Railway Company have decided to build a new electric road on Eighth street. The road will be completed about July 1, and will cost $40,000. Work will be begun at once.

* * The Chattanooga Electric Street Railway Company has bonded the road for $250,000 with the Union Trust Company of Philadelphia, and will build at once. It will run on the principal streets, and to and on Missionary Ridge.

* * In St. Joseph, Mo., where there are two electric railways on the Sprague system, the Union Passenger Electric Railway, and the Wyatt Park Electric Railway, both of these companies, have ordered an additional number of cars to accommodate the somewhat anticipated traffic.

* * D. H. Ogden, formerly identified with the development of the Bell telephone business in the State of Iowa, has recently secured a franchise in the city of Dubuque, Iowa, to construct an electric street railway, which he expects to get in operation during the coming summer. The system has not yet been selected.

* * The Lackawanna Electric Light Company at Taylorville, Pa., have a 300 light Eickemeyer dynamo, and run arc and incandescent from the same dynamo, using the Ball arc. A 25 horse-power Westinghouse engine is used. The company is very popular with the citizens, and is highly complimented by the *Journal* of that city.

* * A committee of the Wisconsin legislature is considering the question of lighting the capitol by electricity. A Mr. Ring thought it wise to go slow in this matter. The committee has reported, he said, that the total cost of putting in an incandescent lighting plant would be $14,500; but he had investigated the subject somewhat and had found that the introduction of the new system would probably require $12,000 to be laid out for the construction of more coal vaults; also that the constant attendance of an expert electrician would be necessary, as well as various other employes, whose annual salaries would range from $1,000 to $2,000. He thought that the aggregate expense of putting in the proposed plant would reach $30,000 instead of $14,500.

* * There is nothing so indicative of the success which has attended the electric street railway installations in this country, than the repeated increase of apparatus ordered by street railway companies using the electric system. During the last week a large number of street railways operated upon the Sprague Electric Railway system have ordered additional number of cars in view of the increased traffic during the summer months which is expected by many of them. Among the railways which have ordered additional equipments are those at St. Joseph, Harrisburg and Wilmington. These railroads have already ordered one set of additional cars, and this order makes the third received by the Sprague Co. in each of these cases for more cars.

New Designs in Electrical Fixtures.

The REVIEW is pleased to present in this issue several illustrations of the recent artistic work of the Mitchell Vance Company of 836 Broadway, New York. This company has assumed its former stand in the front rank of electric and gas fixture houses, and in the midst of very active competition is meeting with a large patronage. The new building of the New York Life Insurance Company at St. Paul, is one of the new contracts of this company. This building is lighted throughout by electricity.

FIG. 3.
ONE-LIGHT COMBINATION PENDANT.

FIG. 1.—NEW DESIGN OF COMBINATION FIXTURE. MITCHELL VANCE COMPANY.

A New Motor in Washington, D. C.

The *Washington Press* described as follows the operation of the electric motor recently tried in that city:

The city was treated yesterday to a spectacle, novel in Washington—one which may mark a period in its industrial progress. A car apparently like any other, but without visible means of propulsion was to be seen running back and forth between Pennsylvania avenue and the stables at the foot of Capitol Hill. Although loaded with passengers it rounded the awkward curves at the Garfield monument with ease, and was started, stopped and reversed by the motion of a lever on the platform. The car belongs to the River and Rail Electric Company, of New York. It has been sent here as a suggestive exhibit, and will return in a day or two to New York. The reserve power is contained in storage batteries concealed beneath the seats. The motor was hardly noticeable either by sight or sound, and even car horses passed with indifference the machine which promises to lighten their hard lot. However ordinary the outward appearance of this car, the construction of the mechanism is novel throughout. The battery plates have been proved to withstand the severe work demanded of them, as the set contained in the car has been in constant use since June last, with but a slight repair to a single cell. This durability would seem almost to decide the success of the system, as the great obstacle in the way of experimenters heretofore has been the disintegration of battery plates. The motor is of a new pattern. No wire is put in motion, the armature is stationary, and the revolving part appears like a smooth disc. The car can be started without drawing heavily on the batteries, by means of a peculiar mechanical device, which enables the motor to start before the car does, its momentum when at full speed being thrown upon the wheels without perceptible jar. Power is transmitted to both axles from a single motor, but with sufficient relative independence to secure a smooth driving action. The company has been working quietly and with perseverance to solve a difficult problem. It appears to have accomplished much. The advantages to be gained by the public are such that they will wish it the success it deserves. The River and Rail Electric Company was founded several years ago by George L. Wright and associates. Mr. Wright is president of the company, and has worked hard in the face of almost insurmountable obstacles, but by pluck and perseverance, and by the judicious selection of assistants, he has, in connection with Professor Main, inventor of the motor, a gentleman of world wide scientific reputation, together with Mr. Petri Palmetto, succeeded in achieving the results obtained. There seems now to hardly be a doubt but that the future motive power for street railroads will be electricity, and that in consequence of Professor Main's invention the necessity of overhead wires has been entirely obviated. An eminent engineer of this city has declared, after examination, that the motor was ne plus ultra.

FIG. 4.—NEW DESIGN OF ELECTROLIER.

FIG. 2.—COMBINATION REFLECTOR.
MITCHELL VANCE COMPANY.

Municipal Gas Lighting Made Easy.

A most ingenious system has been patented by H. T. Downs, of Saratoga, N. Y., of which the patentee says:

"This invention has for its object the organization of a system whereby a number of gas burners may be arranged with lighting and extinguishing appliances in electric circuit and a battery and circuiting devices at a station suitably located, the whole system adapted for operation in such manner that by the simple act of closing a circuit at such station all the burners so connected can be turned on and lighted and similarly extinguished."

Fig. 1 shows the well known "automatic" burner with the Downs improvement, and Fig. 2 is a diagram showing how any number of burners can be controlled from a single point. The gas valve is rotary and is controlled by a ratchet-wheel, which is rotated by a spring-paul attached to a pivoted armature in such manner that the oscillations of the armature drive the ratchet-wheel around, a half-revolution opening the valve, and another half closing it. The oscillations of the armature are obtained by an automatic circuit-breaker or vibrator, the spark of whose break serves to light the gas, for which purpose it is arranged in lighting proximity to the gas-orifice of the burner-tip. By the use of the Downs system a municipal lighting company can light and extinguish their lamps at any time from the station direct, without sending men out over the various routes. The consumption of gas is thus greately economized in time required for lighting and for extinguishing.

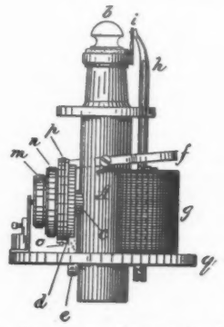


FIG. 1.—BURNER FOR STREET GAS LAMPS.

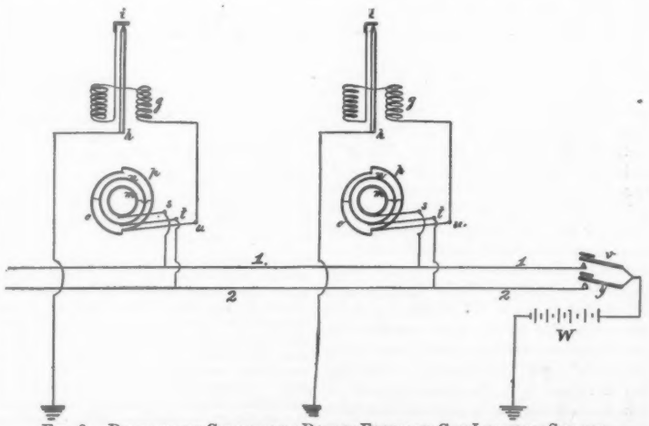


FIG. 2.—DIAGRAM OF CIRCUITS OF DOWNS ELECTRIC GAS LIGHTING SYSTEM.

Portland, Me.—The United States Volta Electric Battery Company has been organized at Portland, Me., with a capital stock of $2,000,000, par value shares, $10. President, George L. Clark, Boston, Mass.; treasurer, A. C. Woodworth, Chicopee, Mass.; directors, A. C. Woodworth, Samuel May, Jr., George L. Clark. Business to be prosecuted, to purchase, own, hold, sell and deal in letters patent on galvanic batteries.

Lewistown, Ill.—Lewistown Electric Light, Heat and Power Company, Lewistown; capital, $10,000; incorporators, L. W. Ross, D. D. Talbot, J. M. Stuart, P. J. Stoddard, R. W. Sears.

The Brush Company, of London, Makes a Fine Business Showing.

At the annual meeting of the Anglo-American Brush Electric Light Company, held recently in London, Lord Thurlow, president of the company, gave a very interesting review of the work of the company. His statement concerning the finances was as follows:

"In the five years from 1883 to 1888 the volume of business has increased from 100, which we put at par, to 307—over 200 per cent. in five years. You see that during the same period of time the gross profits have increased 254 per cent. That, I think, is very remarkable, and I think I can fairly challenge any other electric light company in the world to show similar results. (Cheers.) And we have still one strong feature to dwell upon, and that is that the general charges have not increased—hardly at all—not only not increased in the same ratio, but, if anything, have shown a tendency to decrease. That can only be due to one thing—good management and economy, as introduced by our able general manager, Mr. Garcke, in every branch of the administration. (Applause.) Our general charges have fallen from 100 per cent. to 65 per cent., and I challenge any other electric lighting company in the world to produce a similar and equally satisfactory diagram of their last five years' work. (Cheers.)

"Well, then, to turn to the profit and loss account for this year, you will see the gross profit of this year's transactions and trading reach the very respectable figure of £28,049. I think that is very satisfactory; and to this we have to add a balance, carried forward from last year, of £2,500, making an available balance of £30,612 to carry to general account. You will see on the other side the standing charges. I have referred to them already, generally; but I think I ought to point out that the standing charges show only an increase of 7 per cent. in themselves. The business itself has increased 50 per cent. during the last 12 months, and the standing charges have only increased by 7 per cent."

Bids for Lighting New York.

Bids for lighting the streets of New York with gas and electric lamps for the year beginning May 1 were opened by the Gas Commission last week. The bids of the gas companies in the several districts, now occupied by them, were, per lamp: Consolidated and Mutual, $17.50, the price now paid; Central, $27, and Northern, $28, or $1 less than at present; Equitable, $12, the price to which it is limited by its charter; Yonkers, $28, or $1 less than now; and the Globe, $23, or $2 less than now. The Metropolitan bid $22.98 against the Globe.

The electric lighting companies' bids were: Brush Company, 441 lights at 35 cents a lamp a night in territory where it is not compelled to use the subways, and 65 cents in subway territory; East River Company, 421 lights at 35 or 68 cents, according to the same conditions; United States Company, 429 lights at 35 cents, without qualification; Harlem Company, 89 lights at prices varying from 35 to 60 cents, according to location; North New York Company, 28 lights at same prices as the Harlem Company's; Mount Morris Company, 878 lights at from 28 to 55 cents. The Mount Morris Company now furnishes 18 lights at 32 cents. By its bid it competes with the United States, Brush, East River and Harlem Companies.

The electric light companies assert that they must increase their rates in subway territory because they will have to pay rent to the Subway Company.

Seven of the companies procured from the Board of Aldermen on May 31, 1887, the right to put up poles and string wires in the streets on condition that each should furnish the city one light free for every 50 arc lights it supplied to private persons. On the motion of Mayor Grant the commission directed its secretary to ascertain and report whether that contract has been fulfilled.

—— Brockton, Mass., is advertising for bids on electric lighting for a term of two years.

Ten Horse-Power Constant Current Motor for Ampere Circuits.

There are eighteen layers on each core of the field magnets of the new Excelsior motor, (Hockhausen's invention) illustrated on this page; from each layer a wire is brought to a switch segment, the travelling switch spring connecting the coils from each core in multiple arc successively. The cutting in and out of the field coils is accomplished by means of a centrifugal governor. When the motor is loaded up to its maximum capacity all field coils are in circuit; when running idle, all the field coils are cut out. The armature and field are connected in series. Resistance of armature, 1.8 ohms. Resistance of field 4.2 ohms. When running under full load consumption of current, 7,460 watts are utilized for production of power and 600 watts wasted in overcoming resistance of motor. Friction, Foucault and eddying currents necessitate an additional loss of 150 watts.

The Electric Light in Portland, Oregon.

The Mayor's message contains the following reference to the electric light work in Portland, Oregon:

"Street lights now maintained by the municipality amount to 29 electric arc lights of so-called 2,000 candle power and 705 incandescent electric lights of 16 candle power, nominally equalling 75,580 candle power, and costing the city the sum of $2,182.32 per month. At the beginning of last year there were in use, according to my preceding report, 25 arc and 620 incandescent lights, at a monthly cost of $1,917.17 per month. The total cost during the year 1888 was $24,726.29. About 18 months ago the city had 546 incandescent lights, and 23 arc lights at a cost of $1,705.47 per month, being an average monthly cost of $21.45 for each arc, and $2.22 for each incandescent light. As the contract price for additional lights is $20 and $2.05 respectively, the increase in the number of both kinds of lights has reduced the average monthly cost per light to $21.15 for arcs and $2.18 for incandescents.

"The proposition under consideration several years ago to light the streets in the business parts of the city, and as far back as Seventh street with arc lights, and the balance of the city with incandescent lights at an increased cost of about $500, is one which ought to meet with general approbation. As a matter of economy, provision ought to be made for not operating the street lights on clear moonlight nights. In this way a considerable sum might be saved during the year. It could be arranged so that some officer of the police department could order the lights "turned on" in case the weather became unexpectedly cloudy."

—— Superintendent H. H. Johnson, of the Hartford Electric Light Company, was agreeably surprised Tuesday evening by the presentation of a handsome gold-headed cane from the employés of the company. Mr. Lawrence Furlong made the presentation speech in behalf of his associates. On the elaborately chased handle is engraved: "Presented to H. H. Johnson by the employés of H. E. L. Co., March 26, '89". An impromptu collation was served in the office after the presentation.

—— Chelsea, Mass., is talking of a municipal electric light plant.

—— Holyoke, Mass., is to have largely increased electric illumination. The Schuyler and Edison systems are used.

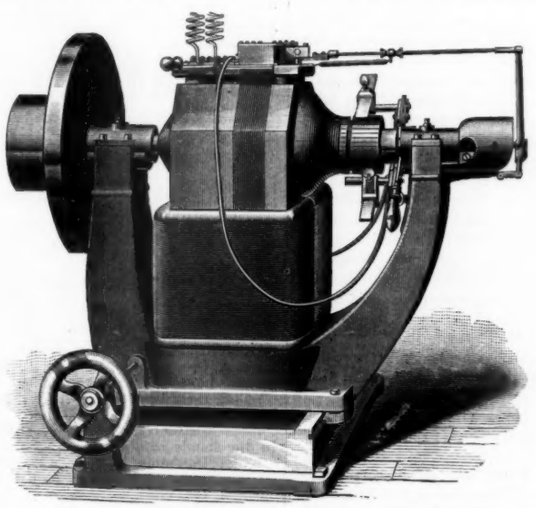
—— The Sperry Electric Company have sold a six arc light plant complete for the steamer "Wm. D. Ellis," Columbus, Ga.

—— Mr. Charles L. Foss, of Biddeford, Me., has been appointed manager of the Edison electric light plant at Claremont, N. H.

—— The Sperry Electric Light Co. has just put in a two arc light plant complete to local parties for shipment to Elmira, New York.

—— The Sperry Company has just furnished a six arc light plant to the Chicago, Wilmington and Vermillion Coal Company, to be used in their mine at Braidwood, Ill.

—— The Westinghouse Electric Company report the following recent installations of their Waterhouse arc lighting plants, viz.: Central stations: Allegheny, Pa., the Allegheny Co. Light Company, 200 lights; Benecia, Cal., Benecia Electric Light Company, 10 lights; Florence, Ala., Florence Electric Light Company, 35 lights. Isolated plants: North Fork, Cal., Humboldt Lumber Mill Company, 10 lights; Johnstown, Pa., Woolf, Son & Thomas, 20 lights.



New Arc Motor of the Excelsior Electric Company.

—— The Hartford *Courant* cites the latest case of electrical "surgery:" "A dynamo at the Hartford Electric Light Company's Works was used again last evening to extract a piece of iron from the hand of a man. The patient was Karl Svendsen, a blacksmith employed at the Hartford Hammer Works. Four weeks ago he got a splinter of steel in his left hand between the thumb and forefinger. It refused to come out and set up an angry inflammation. Last evening he visited the works, held his hand for about half a minute in front of one of the dynamo magnets and out came a piece of steel about a quarter of an inch long. It had been deeply embedded and the extraction caused no pain."

—— The Van Depoele Company have closed the following contracts: A 60 arc light plant for Titusville, Pa., for street lighting; a 20 arc light plant to C. W. Partridge's New York store in Chicago; a 500 incandescent plant to the Bessemer Electric Light Company of Bessemer, Ala.; a new 40 light dynamo to Elgin, Ills., an increase to this plant; a 40 arc light plant to the Edison Electric Light Company of Elgin. An increase of 500 incandescent lights to the People's Electric Light Company of Streaton, Ills.; also 60 arc lights to same, making 800 incandescent and 100 arc lights to this company, and two 300 light incandescent and one 50 arc light dynamos to Climax Manufacturing Company of Corry, Pa., for the Lake Side Park Hotel, at Chatauqua Lake.

ELECTRIC LIGHT NEWS

—— Searcy, Ark., is to have an electric light system, a home company having been formed.

—— The Waltham Electric Light Company have under consideration the matter of introducing the alternating system of lighting with incandescent lights.

—— The Schuyler Electric Company, have installed a 50-light 2,000 candle-power arc light plant at the station of the Edison Illuminating Company, at Altoona, Pa.

—— A controversy is raging in Dedham as to whether the Dedham and Hyde Park Gas Co., or the Dedham Electric Co., shall furnish electric illumination for the town.

—— The Newburyport, (Mass.) Gas Light Company has purchased the Electric Lighting Company of that city, and proposes to increase its capital stock $60,000 to pay for it.

—— The Mount Morris Electric Light Company, New York City, have added 200 Schuyler Electric Company's lamps, with dynamos and station equipment, to their plant.

—— The Piedmont (West Va.) Electric Light & Power Company, capital stock, $20,000, has been chartered by G. M. Harrison, J. S. Jamerson, H. G. Buxton and others.

—— The Norwalk & South Norwalk Electric Light Company, of Norwalk, Conn., using the Schuyler system, have been awarded a five years' contract for lighting the city.

—— M. R. Ludwig, Lawrence, has been appointed superintendent of the Lawrence Edison Illuminating Co., to fill the vacancy caused by the resignation of Superintendent Brock, who left to accept a position at Patterson, N. J.

—— Winchester, Va., Gas Light Company have purchased an arc light plant of the Schuyler Electric Company. Before deciding the matter, they made a very critical examination of the various systems, having placed themselves in communication with over 300 cities using arc lights.

—— The distribution of the electric light at the new Union Square theatre is particularly well done and most brilliant and striking effects are secured. The Manhattan Electric Company furnishes the current (Ft. Wayne alternating), and manager J. M. Hill of the theatre is greatly pleased.

—— At Bangor, Me., the city has voted to contract with the Brush Electric Light Company for an electric light plant of 165 lights; power to be obtained from the Bangor water-works. The contract price is $25,000, and it is agreed that the plant shall be established within 90 days from signing the contract.

—— The electric light company of Hutchinson, Kas., has found it necessary to enlarge the plant, which is already quite extensive, having about 800 incandescent and 60 arc lights. The business is increasing to such an extent that they will have to put in two new dynamos and two new boilers and a new engine, the object being not only to supply light, but power.

—— Hon. M. S. Chapman has been elected president of the Perkins Electric Lamp Company; W. G. Halm, vice-president; C. T. Welles, of the City bank, Hartford, treasurer; and J. J. Gates, secretary. These officers, with Charles B. Whiting, president of the Orient Insurance Company, of Hartford, will constitute the board of directors. The business office of the concern will be in Hartford, though the manufacturing and shipping will be done at the Mather factory, in Manchester. The capital stock is $50,000.

MANUFACTURING NOTES.

Brush Electric Company.—This company is making a number of large shipments to Western mines.

The Julien Electric Company.—This company presents an interesting synopsis of Judge Coxe's storage battery decision on page 14.

The Empire City Electric Company.—This enterprising company finds its present large factory facilities overcrowded, and is arranging for additional room.

The Schenck Belt-Holder and Shifter Company, of which Mr. E. P. Gleason is president, have removed their office to 189 Mercer street, the New York headquarters of the Gleason & Bailey Manufacturing Company. The outlook for increasing business seems most promising.

Removal of E. E. Garvin & Company.—Messrs. Garvin & Company, the widely known machinery manufacturers of Centre street, have been compelled to move into much larger and more convenient quarters, and have secured a building at corner of Laight and Canal streets (near Broadway). The removal was effected last week.

The Ball Electric Light Co.—The Ball dynamos and arc lamps are meeting with popular favor among users of electric light. This company is quietly increasing its business, particularly throughout New England, and its factory at 9th avenue and 27th street, New York, presents a very busy scene.

Wheatley Kirk, Price and Goulty are to sell by public auction, on Wednesday, April 17, at 12 or 1 o'clock prompt, at their warehouse, the valuable and well-known patents, properties and effects comprising the "Elieson" system of electrical traction by motors and secondary batteries. See advertisement in this issue.

Washburn and Moen.—One of the most valuable little publications issued by any electric wire house, and the one that is continually sought after by electrical workers, is the one issued by Messrs. Washburn and Moen, 12 Cliff street, City. It contains a great deal of valuable data, much that cannot be found in any other electrical publication, and is sent free on application.

The Arsino Electrical Company.—Mr. C. B. Arsino, the enterprising manager and proprietor of the C. B. Arsino Electrical Co., has secured so extensive a trade outside of his large patronage in Springfield, Mass, that he is obliged to open a branch office in Hartford, Conn., at 297 Main street, opposite the City Hall, which will be in charge of Mr. Willard A. Rice, late of the Electric Light and Power Co. in Greenfield, Mass.

The Wyckoff Pipe Company.—This company shipped from Williamsport, Pa., week before last, 65,635 feet of their tubing for use in underground cable work. Mr. Frank T. Wyckoff has recently been granted a patent on an auger-bit for boring wooden tubes of a special design. This bit is very necessary in making tubing for underground work, and Mr. Wyckoff has granted the sole right to use it to the Wyckoff Pipe Company.

Novelty Electric Company.—The Novelty Electric Company, of 50-54 North Broad street, Philadelphia, of which Mr. Charles E. Trump is manager, has just issued a very interesting and attractive catalogue of 160 pages, which is most profusely illustrated and which contains a large amount of valuable matter. Every branch of electrical industry is apparently represented within the covers of this catalogue. The Novelty Company is the sole agent in Philadelphia of the Okonite Company, and presents several pages in the new catalogue descriptive of the well known wires and cables manufactured by this company. Electric motors, dynamos and lamps are also handled by this company, and illustrated in the catalogue.

The Standard Paint Company.—This company's paints and electrical compounds are becoming more and more popular with electrical companies. The E. S. Greeley & Co., of Dey street, New York, have commenced to handle these goods, realizing their peculiar excellence. An instance of the value of the P. & B. insulation is reported from Philadelphia, where a city cable was drawn out of a conduit where it had been in use for two years, and the P. & B insulation was found to be in just as good condition as it was when it was put in two years ago. The American Telephone and Telegraph Company use P. & B. for coating the wooden boxes in which their underground wires are buried. All of our readers interested in insulation should write to the Standard Paint Company, 59 Maiden Lane, for this company's recent catalogues.

The John Stephenson Company, Limited, of this city, have received an order for 30 electric cars for the Julien Storage Battery system, to be used on the Fourth and Madison avenue line in New York City. The cars are to be 16 foot bodies, mounted on independent rigid trucks, with two motors directly geared to the axles. They are to have the Stephenson truck, with latest improvements, including wheel and track brakes, capable of stopping the car almost instantly. All working machinery is to be detached from the car body, which will have glass of extreme height, cushioned with rubber in sash frame of bronze metal, affording a quietness and comfort not before had.

Health is regarded by the ventilating ceiling, which changes the atmosphere and keeps the car comparatively cool in summer. This system of ventilation has been recommended by special action of the board of health, of Philadelphia.

In fact, every valuable appliance will be incorporated in the construction and fitting up of these cars.

Fully equipped with motors and batteries they will weigh about six tons each.

C. R. Vincent & Company.—Recent developments in the direction of compounding high speed engines are attracting marked attention from steam users as a step in the direction of higher efficiency without sacrificing the recognized advantages of compact power driving direct to dynamos or other rapidly rotating machinery.

A new feature in this development which will be watched with interest, is the use of this type of compounds without the condenser, in localities where cheap water for condensation is not available.

It is believed that high steam pressure, expanding through two cylinders, will effect a clear saving that will more than justify the small additional expense of compounding.

The general manager of the Edison Electric Illuminating Company, of Brooklyn, and formerly chief engineer of the Edison United Manufacturing Company, has selected this type of engine for the mammoth central station now being erected at 360 Pearl street, Brooklyn, where the energy of 3,000 horse-power will be sent out in electric currents through an underground system radiating through nearly a mile in all directions from the station as a center.

The engines for this work will be furnished by the Ball Engine Company, of Erie, the order having been placed with their New York agents, C. R. Vincent & Company, 15 Cortlandt street, for 12 engines each of 250 horse-power capacity.

The general plan of these engines will be of the double horizontal type with opposite cranks and one high pressure and one low pressure cylinder.

Each engine will weigh about 30,000 lbs., thus making 12 full car loads for the engine equipment of this station.

Steam will be supplied at 125 lb. pressure by a battery of Babcock & Wilcox boilers, situated on the same floor with the engines.

Annual Report of the American Bell Telephone Company.

The consolidated statistics of Bell Telephone Exchanges, etc., are given in the following tables:

EXCHANGES.

	1884.	1885.	1886.	1887.	1888.	1889.	Increase over 1888.
Exchanges	906	772	747	736	739	742	3
Branch Offices	419	481	428	446	452	452	
Miles of Wire on poles		88481	100332	111349	127839	142631	14792
Miles of Wire on buildings		11886	10043	10587	10225	10266	41
Miles of Wire underground		1225	3417	6030	8009	17038	9029
Miles of Wire sub-marine			254	265	365	536	171
Total Miles of Wire	85896	101592	114046	128231	146438	170471	24033
Total circuits	97422	107440	112067	121260	132004	143687	11683
Total employés	4762	5168	5438	5843	6183	6310	127
Total subscribers	123625	134847	137750	147068	158712	171454	12742

EXTRA-TERRITORIAL LINES.

	Jan. 1, 1884.	Jan. 1, 1885.	Jan. 1, 1886.	Jan. 1, 1887.	Jan. 1, 1888.	Jan. 1, 1889.	Increase during 1888.
Number of lines	598	826	897	911	927	947	20
Miles of pole lines	20592	25766	30697	31143	32478	34010	1532
Miles of wire	29359	35631	41745	43767	56179	73293	17114

UNDERGROUND WIRES.

Exchanges.	Jan. 1, 1886. Miles.	Jan. 1, 1887. Miles.	Jan. 1, 1888. Miles.	Jan. 1, 1889. Miles.	Increase over 1888. Miles.
Albany	.....	1	1	1	
Boston	289	347	736	1580	844
Brooklyn	134	1283	1443	2197	754
Chicago	760	1462	2000	3127	1127
Detroit	.....	82	175	500	325
Louisville	.....	9	238	469	231
Milwaukee	1	1			
New York	637	827	1120	5203	4083
Pittsburgh	614	966	958	2370	1412
Washington	992	1302	1338	1591	253
American Telephone and Telegraph Co.'s long distance wires	3417	6080	8009	17038	9029
	.....	.....	140	327	187
Total	.....	.....	8149	17365	9216

INSTRUMENTS.

In the hands of licensees, under rental, December 20, 1884	325,574
In the hands of licensees, under rental, December 20, 1885	330,040
In the hands of licensees, under rental, December 20, 1886	353,518
In the hands of licensees, under rental, December 20, 1887	380,277
In the hands of licensees, under rental, December 20, 1888	411,511
Increase during the year	31,234

EXCHANGE CONNECTIONS.

The estimated number of exchange connections daily in the United States is	1,051,566
Or a total per year of	383,821,590
The number of daily calls per subscriber varies in different exchanges from 3 to 14, the average throughout the United States being	6 13-100

The average cost to the subscriber varies according to the size of the exchange and character of the service, from 2 to 8 cents per connection.

EXTRA-TERRITORIAL CONNECTIONS.

The average daily number of extra-territorial connections is	7,222
Or a total per year of	2,636,030
The extra-territorial earnings for the year amounted to	$771,734 28
Of which the company's share is	79,792 67
An increase over 1887 of	3,716 31

It will be seen that the net output of instruments under rental was 31,234, an increase of 4,475 over 1887, and the largest number since 1883.

The mileage of wire is 243,764 as against 201,911 in 1887. Many of the local companies are replacing iron wire with copper for extra-territorial work.

The lines of the American Telephone and Telegraph Company have been extended during the year 1888 from Albany to Buffalo, and new lines have been built from Chicago to Milwaukee and from Boston to Providence. An additional pole line has also been constructed between New York and New Haven. Altogether, about $2,200,000 has been spent on the long lines, which now comprise 26,088 miles of wire.

The service on the long lines has been excellent and the business is increasing, but the best results cannot be expected until the principal exchanges shall have adopted the metallic circuit system; exchange subscribers in the cities connected by the long lines will then be able to converse directly through their exchange instruments.

Bills for the regulation of telephone rates have been introduced in several State Legislatures, but none of them have been enacted. Four years ago a law was passed by the Legislature of the State of Indiana, limiting the charge for telephones to three dollars per month. The consequences of this were at once to arrest the development of the business in that State and prevent the introduction of improvements, and presently to limit seriously the service and impair the quality of it. These results were so apparant, and showed so plainly the injustice and unwisdom of such legislation, that at the last session of the Legislature, the law was unconditionally repealed by a large majority in both houses.

In the "Telephone appeals" a motion made to re-open the Drawbaugh case was denied.

In the Government case, so called, our demurrer, which has been sustained in the court below, was overruled by the Supreme Court, and the respondents directed to answer or plead. Answer and plea were filed in February last.

Since the last report final decrees in favor of the Bell Telephone Company have been entered against the following companies:

American Cushman, and Cushman Telephone and Service Companies, at Chicago; the Pan Electric Telephone Company, at Baltimore; its branch, the National Improvement Telephone Company of New Orleans; and five Pan Electric Companies in Texas, and one in St. Louis; the Emmner Telephone Company, of West Virginia; the Southern Telephone Company, of Little Rock, Arkansas, and the Wallace Company, of New York.

On December 30, 1889, Elisha Gray filed with the Commissioner of Patents a motion and request, alleging fraudulent proceedings in the Patent Office in the prosecution of the Bell application and with relation to the Gray caveat, and alleged that in the prosecution and the trial of the interference there was collusion, because the application of several of the parties were owned and held in the interest of the Bell Company, and that he had discovered new and important evidence touching all of said matters.

On these and other grounds he asked that the decision in said interferences be set aside and the interferences re-opened. On March 2, 1887, James W. McDonough filed a similar motion and request, setting forth the same and other grounds for it. Thereupon, beginning February 1, 1888, the two motions were argued before the Commissioner in person, the trial and arguments lasting eight days. The parties introduced, as new evidence, all the evidence laid before the Department of the Interior in October and November, 1885, on which the Government suit was ordered, and also other proofs. The Examiner gave the case a very exhaustive examination, and on February 23, 1889, gave a written opinion, deciding that all of the proceedings in the Patent Office were just, lawful, right and proper; that there was no fraud therein; that there was no fraud or collusion in the prosecution, trial or decision of those interferences; and that the decisions therein were right and should be respected, and denied both of the motions on their merits.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING MARCH 26, 1889.

399,822 Electric blast blower; Harry H. Blades, Detroit, Mich.
399,826 Electric conductor; Alfred A. Brooks, Cambridge, Mass.
399,876 Circuit-closing device for electrical torpedo fuses. 399,879 Electrical fuse for ordnance shells; James W. Graydon, Washington, D. C., assignor to Robert Southworth, Lawrence, London, England.
399,950 Friction gear for electric motors; Charles J. Van Depoele, Lynn, Mass.
400,011 Game apparatus; Thomas B. Rogers, Brooklyn, and Samuel H. Bartlett, New York, N. Y.
400,028 Electric alarm signal for cables; William H. Woodring and Clarence S. Gilbert, Kansas City, Mo.
400,038 Electric railway plow; Edward M. Bentley, New York, N. Y.
400,050 Annunciator; Ira S. Bunker, Nevada, Mo.
400,068 Galvanic battery; Carl E. Kammeyer, Chicago, Ills., assignor to the Electrical Supply Co., Ansonia, Conn.
400,126 Galvanic battery; Frank Shaw, New York, N. Y.
400,130 Dynamo electric machine; William L. Silvey, Cincinnati, Ohio.
400,139 Switch stand for dynamo stations; Robert E. Stewart, Dallas, Texas, assignor to himself and John Hugh Spivey, same place.
400,140 Lantern or lamp; George W. Stockly, Cleveland, Ohio.
400,141 Telegraphic transmitter; Ross C. Stone, New York, N. Y.; Samuel Wesley Smith, administrator of said Ross C. Stone, deceased.
400,179 Electric railway contact. 400,180 Electric railway plow. 400,181 Method of detecting grounds in an electric distributing system. 400,182 Fault detector for electric railways, Edward M. Bentley, New York, N. Y.
400,198 Electric arc lamp; Edgar A. Edwards, Cincinnati, Ohio.
400,214 Electric lighting system; William L. Horne, Meriden, assignor to the Horne Vacuum Company, Hartford, Ct.
400,215 Galvanic battery; Alexander Imschenetzky, St. Petersburg, Russia.
400,224 400,225 400,227 Voltaic battery. 400,226 Secondary battery; Isidor Kitsee, Cincinnati, Ohio, assignor to Mayer Sulzberger, trustee, Philadelphia, Pa.
400,235 Galvanic battery; Edward Liebert and Sally A. Rosenthal, Berlin, Germany.
400,239 Electric burglar alarm; Joseph Y. McKinney, New Wilmington, Pa.
400,245 Throttle valve controller; Gustave S. New, New York, N. Y.
400,264 Automatic grounding device; Elmer A. Sperry, Chicago, Ills.
400,274 Friction gear for electric motors; Charles J. Van Depoele, Lynn, Mass.
400,288 Time recorder; Harvey R. Adams, Marseilles, Ill.

WANTED.

EXPERIENCED AGENTS WANTED to sell isolated plants and central stations by an electric light company. Kindly send full particulars, experience, and names of plants closed by applicant.

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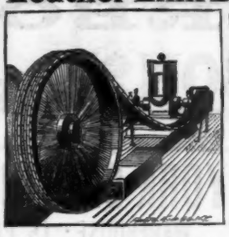

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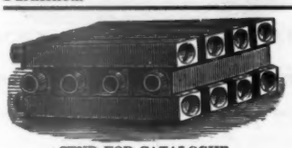

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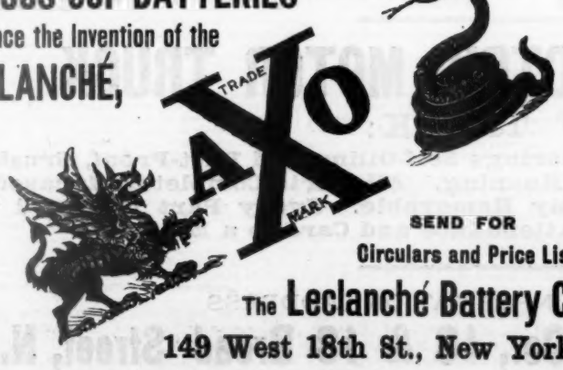

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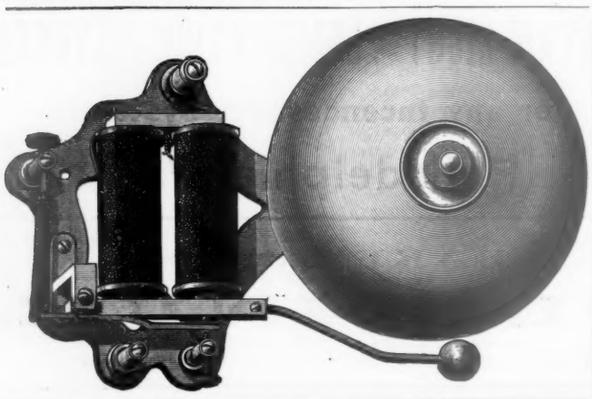

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ARE INSTRUCTED TO SELL BY PUBLIC AUCTION,

On Wednesday, April 17th, at Twelve for One o'Clock prompt, upon the above Premises, the valuable and well-known Patents, Properties and Effects, comprising the "Elieson" System of Electrical Traction by Motors and Secondary Batteries.

By a series of costly experiments, extending over four years, the above-named Company has successfully demonstrated the practicability of electrical traction as applied to ordinary tramways. It is the only system of electrical traction, by secondary or storage batteries, that has worked continuously in public service in the United Kingdom for a lengthened period uninterruptedly, and during such period the motors of the Company have run nearly 50,000 miles. The time has now arrived when large extensions are absolutely necessary for the introduction of the system into general use, and the means at the disposal of the Company being insufficient for this purpose, it has been decided to submit the entire property to public competition, with a view that capitalists, companies and others interested may purchase and vigorously develop the same in this country and abroad, and to facilitate this, the British, Foreign and Colonial Patents will be offered separately.

Lot 1. will comprise the British Patent Rights, together with the Leasehold Premises, Engines, Boiler, Shafting, Motor-Cars, Dynamos, &c., forming the complete generating plant and installation, as fully described in detailed catalogues, including concessions and running powers. The purchaser of Lot 1 will have the option of purchasing the loose utensils, stores, &c., at a price to be named at the time of sale.

Lot 2. and succeeding lots will will consist of the American, Colonial and Foreign Patent Rights, each of which will be offered for sale separately. Included with the American Patents will be the Motor-Car No. 3, with its equipments, now lying at New York, and which may be viewed by permission of the Belt Railroad Company at their depot in 53d street and 10th avenue; this has been exhibited at Buffalo and elsewhere.

Further particulars and descriptive catalogues may be obtained from MESSRS. VINCENT and VINCENT, Solicitors, 20, Budge-row, E. C., from T. P. GOWER, Esq., 4, Broad-street-buildings, Liverpool-street, London, E. C. (the Secretary of the Company), and from WHEATLEY KIRK, PRICE and GOULTY, 52, Queen Victoria-street, London, E. C. (Telegrams, "Indices," London; Telephone, 1588), and Albert-square, Manchester, England.

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REPORT of a series of tests of the insulation resistance, capacity and conductivity of a sample covered wire sent by

The India Rubber & Gutta Percha Insulating Co.

The sample submitted for measurement was 2027 ft. in length.
Thickness of insulation was .281 c. m.
Diameter of wire .1632 c. m.

The wire was extremely flexible and was coiled and uncoiled several times before measurements were made.

The insulation consisted of several layers of India rubber, with an external cotton braiding.

The coil was immersed in water on Dec. 16 at 8.30 P. M., and tests were begun the following morning. Both the Direct and Loss of Charge methods were employed. The following are the results:

Capacity in Microfarads per Knot.	Insulation Resistance in Megohms per Knot.	Temperature Centigrade, Degrees.	DATE.
.453	11240	8.5	Dec. 17
.441	9558	13.3	Dec. 18
.456	10080	13.0	Dec. 19
.441	10183	11.0	Dec. 20
.450	9620	10.8	Dec. 21
.450	10000	12.0	Dec. 27

Direct deflection 7200 meghoms per knot at 12° C. on Dec. 27th. Conductivity was obtained by making a number of measurements of the diameter of the wire, and a determination of the resistance of the entire length of the sample at a definite temperature.

The conductivity was 98.5 per cent. that of pure copper as given by Matthiessen.

For the eleven days that the wire was in water the insulation resistance remained practically unchanged, and the slight variation which occurred can be accounted for by the difference in temperature, etc.

The insulation seems to be less affected by changes in temperature than that of other samples which we have tested at various times. Very respectfully,

[Signed] **LOUIS DUNCAN,**
C. A. LIEBIG, Jr.

JANUARY 5th, 1889,
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THE JULIEN ELECTRIC COMPANY.

RECENT STORAGE BATTERY DECISION.

SYNOPSIS OF THE COURT'S DECISION IN JUDGE COXE'S OWN WORDS.

Some controversy having arisen as to the extent of the recent decision of Judge Coxe, in the important case of The Electrical Accumulator Company against the Julien Electric Company, we give below so much of the text of the opinion as is necessary to enable the reader to determine just what the Judge actually decided. As the opinion covers in all 57 pages of type-written matter, we are unable to give it in full.

UNITED STATES CIRCUIT COURT.

SOUTHERN DISTRICT OF NEW YORK.

THE ELECTRICAL ACCUMULATOR COMPANY

vs.

THE JULIEN ELECTRIC COMPANY AND WILLIAM BRACKEN.

} In Equity.

FREDERIC H. BETTS for the Complainants.
THOMAS W. OSBORN and HORACE M. RUGGLES for the Defendants.

COXE, *J.*:

"This is an action for the infringement of four letters patent, owned by the complainants, for an improvement in secondary electrical batteries. One of these, No. 266,262, granted to Shaw and Rogers, October 17, 1882, has been withdrawn from the consideration of the Court. The three in controversy are No. 252,002, granted January 3, 1882, to Camille Alphonse Faure, and Nos. 312,599 and 318,828, granted, respectively, February 17 and May 26, 1885, to Joseph Wilson Swan."

The Court, after discussing the general nature of the improvements described in the patent of Faure, said: "The claims in controversy (in Faure Patent No. 252,002) are the first and the fourth."

After a summary statement of the defenses presented by the answer of The Julien Electric Company, the Court says:

"In construing the first claim it should be remembered that it is limited to an improvement upon the well known batteries of Gaston Planté, who was the creator of practical secondary batteries. The art began with him."

The Court next proceeds to discuss the proper construction of the first claim, and after defining its scope considers the proofs of anticipation and prior use offered by the defendant.

"It therefore becomes apparent that the combination of the first claim, construed as it must be construed under the loose and inaccurate language of the specification, is anticipated in every form in which the active layer can be applied, save one—namely, in the form of a *paint, paste* or *cement*. The question now to be considered is can the *patent* be *saved to this extent? The application in the form of a paint, paste or cement was the real invention which Faure made.*"

* * * * * * * * * * * * * * *

"The proof establishes two propositions with equal clearness. First, Faure was the inventor of a secondary battery electrode coated in the manner stated; and, second, he was not the *inventor of an electrode otherwise coated.*"

"If, by means of a disclaimer, the patent can be restricted to the actual invention, this course should, in fairness, be adopted."

* * * * * * * * * * * * * * *

"What he did not invent was an electrode in a secondary battery coated with a soluble layer of active material, neither did he invent an electrode on which the active material is applied by 'galvanic action or chemical precipitation or otherwise.' * * * * * * * * * *No one will infringe unless he constructs his battery in the one way to which the patent will be confined.*"

* * * * * * * * * * * * * * *

"After giving the subject the most careful consideration, it is thought that Faure was the originator of the invention just described, and that it would be unjust to him to declare the patent wholly void if he is willing to restrict it to what is lawfully his own."

The Court immediately proceeds to discuss the fourth claim of Faure's patent.

"The fourth claim, if construed to cover the defendents' structure, is void for want of novelty. * * * * * * * * * * * * *

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HIS PATENTS SUSTAINED

BY THE

United States Supreme Court.

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SUSTAINING THE EDISON PATENTS.

In the many suits brought by the Edison Company, in the lower courts, against infringers of the Edison Patents, the defendants have evaded the MERITS of the controversy, thus tacitly admitting the fact of infringement, and have interposed a plea alleging that our Patents have been voided by the expiration of Patents previously granted in foreign countries.

Hence the delay in establishing our rights. In the meantime other electrical companies have been indiscriminately copying our devices and methods, not even assuming that they themselves were the original inventors, but simply relying upon the construction of a statute by the lower courts invalidating our fundamental Patent. In pursuance of our expressed determination to secure a decision upon the point of law involved, we have had the Bate Refrigerator case (covering the identical question) argued before the United States Supreme Court, with the result announced above, thus

Completely depriving the Defendants of their Main Defense.

We have now only to prove the fact of infringement in order to secure prompt injunctions against and damages from those who have been so long using with impunity that which the HIGHEST AUTHORITY now concedes to have been ours, exclusively, from the beginning. This is simply to establish

A QUESTION OF FACT.

WAS, OR WAS NOT EDISON THE ORIGINAL INVENTOR?

This question has been decided in his favor a great many times, primarily by the United States Patent Office, which granted to him Patents bearing earliest dates; then by the various courts of Europe, through the crucial examination of which the question has MANY TIMES passed.

Thus the QUESTION OF LAW having now been settled by the United States, and the QUESTION OF FACT by the highest experts of the world, this Company now notifies the public of its intention to call a halt and demand a reckoning for the trespass and abuse of its rights in

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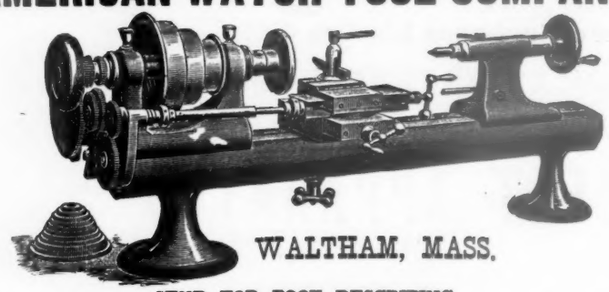

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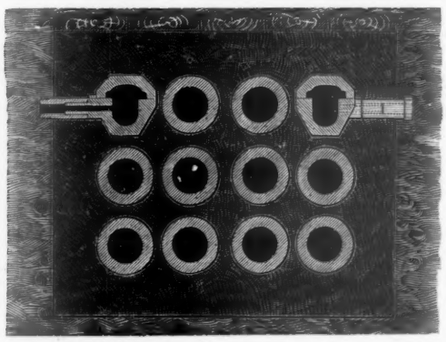

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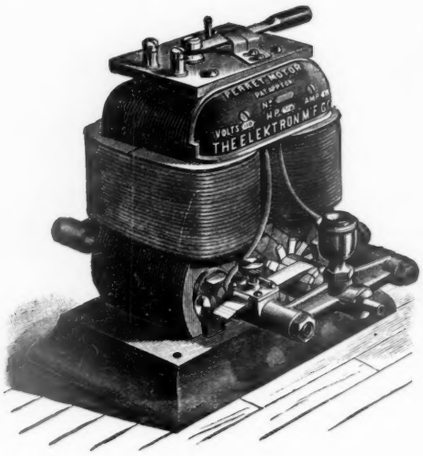

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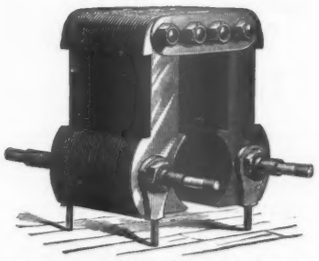

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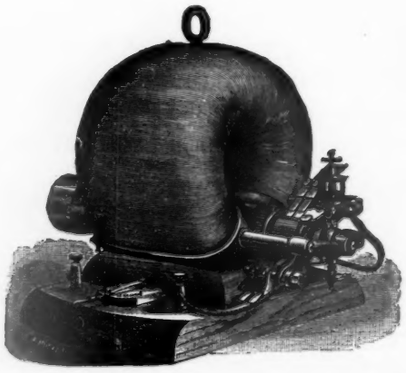

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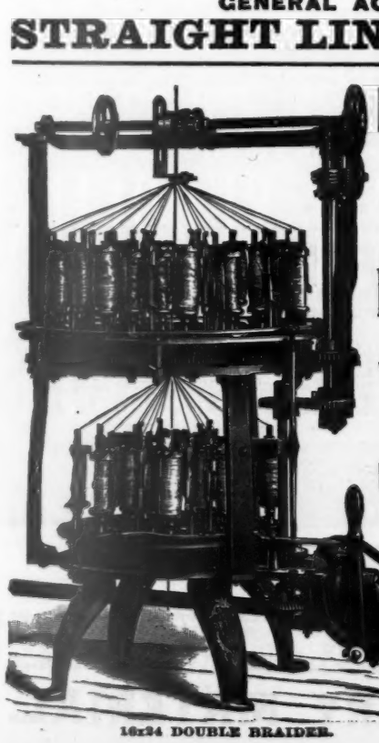

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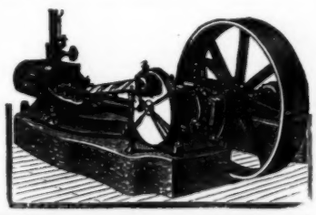

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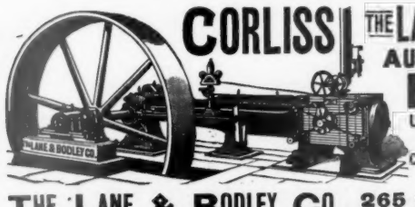

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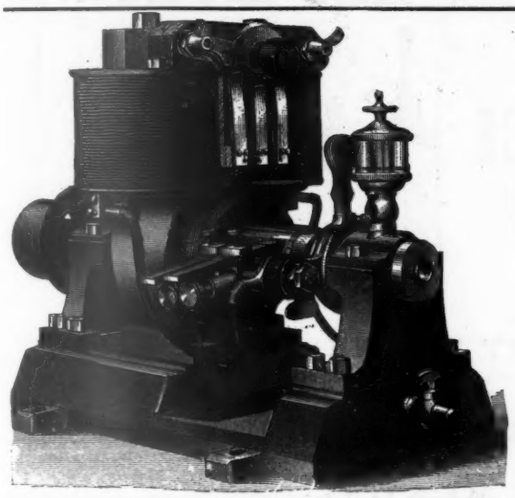

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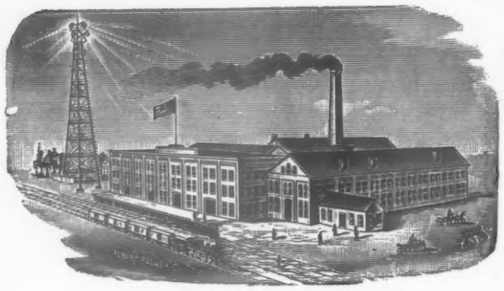

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